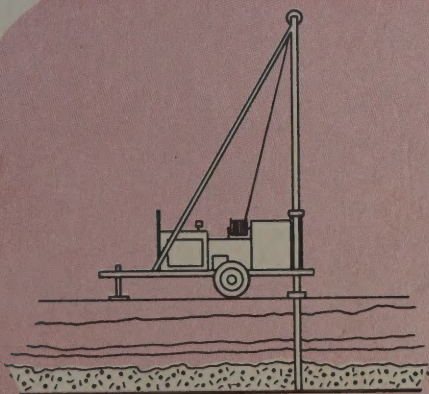
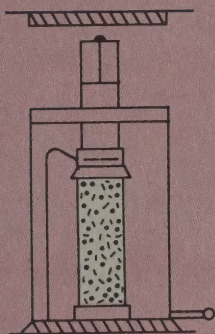


STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

RAYMOND T. SCHULER, COMMISSIONER



SOIL MECHANICS
BUREAU



CAYUGA LAKE BASIN
SIXMILE CREEK DAMSITES
GEOTECHNICAL STUDY
FOR FEASIBILITY EVALUATION

PIN E103-00-701.02

JUNE 1973

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Raymond T. Schuler, Commissioner



1220 Washington Avenue, State Campus, Albany, New York 12226

July 9, 1973

Mr. John A. Finck
Director of Water Resources Planning
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12205

Dear Mr. Finck:

Subject: Cayuga Lake Basin
Sixmile Creek Damsites
Tompkins County
P.I.N. E103-00-701.02

In accordance with your request of August 25, 1971 to Mr. B. A. Lefevre, we are transmitting to you the attached report, "Cayuga Lake Basin, Sixmile Creek Damsites, Geo-technical Study for Feasibility Evaluation".

In preparing our report, we were aided by information supplied by members of your staff and by subsurface exploration work performed by our Regional Soils Section. This study and report was prepared by Mr. Austars R. Schmore, Senior Soils Engineer.

Our study of the site conditions indicates that the construction of a dam is technically feasible at both the Bethel Grove Site and the Alternate Site. A very important design-related consideration in determining whether or not to carry out the proposed project is the hazard of the proposed sites -- the fact that they are located only about two miles upstream of a densely populated section of the city of Ithaca. It is true that a chain of reservoirs exists on Sixmile Creek at present. However, the proposed dam, at either site, would increase the quantity of impounded water some ten times. The location of the dam dictates that every possible precaution be taken in the design and the construction of the project to insure that the possibility of a failure is reduced to the absolute minimum.

The findings of our investigation are detailed in the report. The main points can be summarized as follows:

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50 Wolf Road, POD 34
Albany, New York 12232

July 9, 1973

Mr. John A. Finck

Page 2

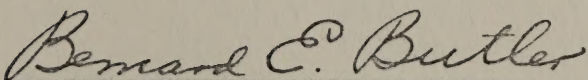
1. The foundation conditions at either site were found to be far from optimum. This problem, in conjunction with the hazard of the site, may diminish the desirability of constructing a dam in this area.
2. Because of the complexity of the sites, a very thorough foundation exploration program will have to be undertaken in the final design phase.
3. Special treatment of various types will be required to insure the safety of the proposed dam. This treatment will significantly increase the cost of the project. Anticipated methods of treatment are described in our report to aid you in evaluating the feasibility of the project.

We will be pleased to meet with you to discuss this report in greater detail.

Very truly yours,

Lyndon H. Moore, Director
Soil Mechanics Bureau

By



Bernard E. Butler
Associate Soils Engineer

BEB:ARS:MVM

Attachment

The attached conditions of license are being sent to you in the form of a letter. This condition is being sent to you in the form of a letter, and should be read carefully as it contains a lot of information.

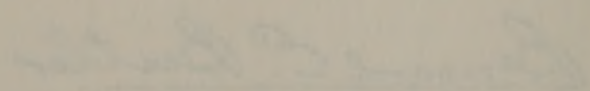
Enclosed with this letter are the conditions of license, and a copy of the license application form which you will have to fill out and return to the State Police.

Special treatment of various types will be required in order to obtain the status of the license. This treatment will also include the payment of the cost of the license. The attached conditions of license are being sent to you in the form of a letter, and should be read carefully as it contains a lot of information.

It will be pleased to send you to discuss this report in greater detail.

Very truly yours,

James H. Hays, Director
State Police Bureau


James H. Hays
Director, State Police Bureau

cc: Mr. Linn

Attachment

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1. INTRODUCTION

1.1 Authorization

This report has been prepared in accordance with a request from Mr. John A. Finck, Director of Water Resources Planning, Department of Environmental Conservation, to Mr. Bernard A. Lefevre, then Chief Engineer, Department of Transportation, dated August 25, 1971. Mr. Lefevre authorized the Soil Mechanics Bureau to proceed with this work on August 30, 1971.

Mr. Finck's request was for foundation information sufficient to permit an evaluation of the feasibility of this project. The project would ultimately consist of a dam, in excess of 120 feet high, constructed at one of two alternate locations that are under consideration. The dam at either site would retain a reservoir extending upstream for a distance of two miles.

For a project of this type the requested information goes far beyond a compilation of boring logs and laboratory descriptions of soil and rock samples. Accordingly, we have prepared this report, which describes the effect of the topographical and geological features and of the conditions disclosed by the subsurface explorations on the design and thereby on the feasibility of the project.

1.2 Scope of Report

The intent of our study and this report was to obtain and present information necessary to establish the feasibility of this project. For this purpose, the topography and geology of the entire area and each alternate proposed damsite was reviewed. The limited number of subsurface explorations made were used to define the general location and character of the dominant subsurface strata. A much more comprehensive exploration program will be required if and when it is decided to proceed further with the design of this project.

On the basis of an evaluation of the information that was obtained, methods of treatment that would be required to achieve an adequate design were selected. These are presented in this report in order to enable you to perform a more valid economic analysis and comparison. The final treatment may be different as additional subsurface information becomes available in the design stage.

Our basic study was made assuming earth dams at both sites, as originally proposed. However, considerations are also presented for the concrete dam scheme later proposed for the Alternate Site.

1.3 Information Utilized in Study

Our study was based on the following information:

1. The proposed layout at the two sites, plotted on prints made from a USGS map and received from your office with a memorandum dated September 14, 1973.
2. A 1:24,000 scale USGS map of Ithaca East quadrangle.
3. Aerial photographs of the area.
4. A United States Department of Agriculture soil survey report for Tompkins County.
5. Field inspections of the two sites by representatives of this Bureau.
6. Various sources describing the geology of this area.
7. A description of the foundation conditions at the two sites, as interpreted from surface observations and previous subsurface explorations, transmitted to us by Mr. K. Davis of your office, August 26, 1971.
8. Subsurface exploration logs from six borings, numbered B-1, and B-3 through B-7 at the Bethel Grove Site and from 7 borings, numbered A-1 through A-4, A-6, A-9, and A-9A at the Alternate Site. These borings were made by personnel of the Department of Transportation Region 3 Soils Section in 1971 and 1972. In general, 2½-inch casing was used in the overburden. However, 4-inch casing was used in borings A-9, A-9A, B-3, B-4, B-5, and B-6. Copies of the logs have been transmitted to you previously and are also included in the Appendix to this report.
9. A visual examination and classification of soil samples from these borings in our laboratory. Moisture contents of plastic soils were determined concurrently.
10. Seismic determinations of the elevation of the bedrock surface at 28 points by this Bureau.

11. A terrain reconnaissance review by personnel of this Bureau.

2.1 Topography

2.1.1 General

The two proposed damsites are located on Sixmile Creek about two miles southeast of the city of Ithaca (See Drawing No. 3SM 1819A). A number of smaller reservoirs have been constructed in the past on Sixmile Creek in the area under study and downstream. The sides of the valley, to a height of 100 to 200 feet above the floor of the Sixmile Creek valley, are considerably steeper than the hillsides forming the general relief of the area. Numerous small streams, draining into Sixmile Creek from the southwest, have carved deep V-shaped gullies. Traces of old and not-so-old landslides are visible on the side slopes of the valley.

2.1.2 Bethel Grove Site

The proposed Bethel Grove Site is located at the upstream end of the existing Ithaca Reservoir. The existing reservoir has a normal pool elevation of 704. The valley here has a flat bottom, about 1000 feet wide. The side slopes are moderate (typically inclined at 1 vertical on 3 horizontal). Two streams draining into Sixmile Creek from the left (looking downstream) form a narrow, steep-sided ridge, across which it is proposed to construct the spillway. Accessibility to the site is good, except in the gully that is the proposed location of the spillway outlet channel.

2.1.3 Alternate Site

The so-called Alternate Site is one half of a mile downstream of the Bethel Grove Site, at the opposite end of Ithaca Reservoir. Here Sixmile Creek flows in a narrow, steep-sided gorge. A small tributary has cut a gully, about 100 feet deep, separating a knob from the southwest wall of the valley. The axis of the proposed dam crosses the steep-sided Sixmile Creek valley, the tributary gully, and the intervening knob. Evidence of numerous landslides, some quite recent, is visible in the gully and on the steep southwest bank of Sixmile Creek.

2.2 Geology

The bedrock in this area belongs to the Genesee group, which consists of alternating, nearly horizontal beds of shale, siltstone and sandstone. During the last ice age, the glacier moving southeast along the axis of the Sixmile Creek Valley scoured and deepened the pre-existing valley and deposited a mantle of till over the bedrock. As the glacier melted, a lake was formed in the valley between the retreating ice front and the divide to the south of White Church. Lake sediments consisting of silts and clays were deposited in the lake. Delta deposits of sand were formed where streams flowed into the glacial lake.

After retreat of the glacier, the lake drained. The post-glacial streams eroded their channels down through the glacial sediments, depositing, in turn, loose alluvium. As stream erosion progressively steepened the slopes, the lake sediments were subject to landslides, a process still taking place.

Sixmile Creek became trapped in the side of the older rock valley at the Alternate Site during the process of re-cutting the valley down through the glacial sediments. Once entrapped in the rock, the creek was no longer free to meander in this section but occupied itself with downcutting along its joint-controlled course.

2.3 Proposed Facilities

As part of this project, it is proposed to impound a reservoir for the purpose of water supply, water quality control, and recreation.

The controlling elevations at the two sites under consideration, as indicated by your office, are as follows:

	<u>Bethel Grove Site</u>	<u>Alternate Site</u>
Elevation of crest of dam	823	808
Normal pool elevation	800	785

Earth dams were proposed originally, with combined service and emergency spillways located in the left and the right abutment at the Bethel Grove and Alternate Sites, respectively. A later scheme proposed a concrete dam with a central overflow section for the Alternate Site.

2.4 Subsurface Conditions

2.4.1 Bethel Grove Site

The locations of borings and seismic determinations made at the Bethel Grove Site are shown in Drawing No. 3SM 1819B. This drawing is an enlargement of a portion of a 1:24,000 scale USGS map and, as such, is considered to be of sufficient accuracy for preliminary purposes only.

Subsurface profiles along lines A-A and B-B are also shown in Drawing No. 3SM 1819B. The number of explorations was not sufficient to determine definite limits of strata. Probable boundaries between different soil deposits have been denoted on the profiles by solid lines. Possible boundaries are indicated by dashed lines.

The uppermost soil stratum found in the borings progressed at the abutments of the proposed dam consists of glacial lake deposits -- layered silts and clays -- stiff in the upper 20 feet but becoming softer at greater depths. Boring B-7, in the right abutment, encountered soft to firm silts and clays to a depth of 81 feet (Elev. 744). In boring B-4, at the left abutment, these materials extend to a depth of 45 feet (Elev. 778). These silts and clays must be assumed to have a low shearing strength and to be quite compressible. The upper brown "crust" of this material will be suitable for embankment construction. However, the lower gray material, because of its high moisture content, should be considered as unsuitable for utilization in the embankment.

Pervious mixtures of compact gravel, some sand, a trace of silt, and containing boulders (probably glacial outwash) were found in the upper 40 feet of boring B-5, on the lower slopes of the left abutment. Below these depths, the above borings encountered very compact bouldery glacial till.

Two borings, B-1 and B-3, were made near the location of the proposed spillway. The soils encountered in these borings were primarily silts with minor admixtures of fine sand, clay, and shale fragments. In boring B-1 (surface elevation 861.8) this material is comparatively loose near the surface, becoming compact only at a depth of 40 feet. In boring B-3 (surface elevation 735.9) this material is extremely compact from the ground surface to a depth of 28 feet where bedrock was encountered.

The bedrock at the site consists of nearly horizontally bedded shale. Only three of the borings (B-3, B-5, and B-6) made along the alignment of the proposed dam were progressed to bedrock. Additional information regarding the depth to bedrock can be obtained from seismic data. The bedrock elevation at each seismic point is listed in a tabulation of seismic data included in this report. The combined boring and seismic data indicate that bedrock is between Elev. 710 and 740 at the right abutment. In the stream valley it is near Elev. 700 or just below ground surface, dipping down to below Elev. 630 at drill hole B-5. In the area of the spillway channel the bedrock surface is near Elev. 700.

Groundwater was observed only in borings B-3, B-5 and B-6, at depths of 2, 4, and 1 feet, respectively. The position of the groundwater level at borings B-4 and B-7 can be inferred from the location of the boundary between the brown and the gray silts and clays. In both of these borings this boundary is at a depth of approximately 15 feet.

2.4.2 Alternate Site

The locations of borings and seismic determinations for the Alternate Site are shown in Drawing No. 3SM 1819C, which is an enlargement of a USGS map and is sufficiently accurate only for a preliminary study.

A subsurface profile along the proposed axis of the dam is also shown in Drawing No. 3SM 1819C. Again, because of the limited number of explorations, the boundaries of the various soil deposits cannot be determined reliably at this time.

Alluvium, consisting of mixtures of sand, gravel, and silt, with traces of organic material was found to depths of about 20 feet in boring A-2 and 8 feet in boring A-6. Otherwise, the predominant surface soils are soft to firm layered silts and clays (glacial lake deposits). These silts and clays were found in boring A-2 between depths of 20 and 63 feet, in boring A-3 to a depth of 52 feet, and in boring A-4 to a depth of about 30 feet. This soil must be assumed to have a low shearing strength and to be highly compressible. The upper brown silts and clays, found in the borings generally to a depth of 20 feet below ground surface, are suitable for embankment construction. The underlying gray silts and clays, because of their high moisture content and low rate of drying, cannot be counted on to provide satisfactory embankment material.

N.Y.S. DOT
Soil Mechanics Bureau
June 13, 1973

Cayuga Lake Basin
Six-mile Creek Damsites
Seismic Data

Seismic Point	Baseline Station	Offset	Ground Elev.	Seismic Depth	Bedrock Elev.
SP-1	31+51	1395' Rt.	828.1	116'	712.1
SP-2	35+25	1078' Rt.	831.9	95'	736.9
SP-2A	33+77	1210' Rt.	830.4	> 70'	< 760.4
SP-2B	32+15	1330' Rt.	829.0	106'	723.0
SP-3	"A" 16+40	0'	824.9	97'	727.9
SP-4	33+90	783' Rt.	827.9	71'	756.9
SP-5	"C" 3+40	55' Rt.	839.3	118'	721.3
SP-5A	"C" 2+10	40' Rt.	846.1	> 100'	< 746.1
SP-6	"C" 0+65	20' Rt.	852.3	> 100'	< 752.3
SP-7	"B" 4+80	10' Lt.	721.1	76'	645.1
SP-8	76+28	590' Rt.	718.1	70'	648.1
SP-9	153+75	32' Rt.	779.2	140'	639.2
SP-10	157+55	40' Rt.	779.2	> 100'	< 679.2
SP-11	153+85	10' Rt.	808.8	177'	631.8
SP-12	148+75	70' Rt.	809.1	> 100'	< 709.1
SP-13	147+92	400' Lt.	809.1	137'	672.1
SP-14	144+75	20' Lt.	809.1	91'	718.1
SP-15	153+48	210' Lt.	809.1	205'	604.1
SP-16	87+30	87' Lt.	856.8	145'	711.8
SP-17	93+65	35' Lt.	891.6	135'	756.6
SP-18	161+70	15' Rt.	724.1	16'	708.1
SP-19	159+95	110' Lt.	724.0	15'	709.0
SP-20	5+50	225' Rt.	826.7	44'	782.7
SP-21	5+85	437' Rt.	807.3	50'	757.3
SP-22	5+15	35' Rt.	849.7	41'	808.7
SP-24	6+48	818' Rt.	779.7	33'	746.7
SP-25	175+22	415' Lt.	826.5	26'	800.5
SP-26	172+38	497' Lt.	802.8	44'	758.8

The compressible lake sediments in borings A-2, A-3, A-4, and A-6 are underlain by very compact glacial till (boulders, gravel, sand and silt). Borings A-2 and A-3 were terminated in the glacial till, 150 feet below ground surface. Borings A-2 and A-6 in the right abutment, however, encountered bedrock at depths of 37 feet and 45 feet, respectively.

Borings A-9 and A-9A were drilled on the lower slopes of the right abutment, where Sixmile Creek has removed the overburden, and bedrock outcrops on the surface. Boring A-9 was drilled vertical while A-9A was drilled adjacent to A-9 at a 45° angle into the rock slope.

As shown on Drawing No. 3SM 1819C, the surface of the bedrock dips gently from about Elev. 780 at the spillway location, outcropping at about Elev. 750 on the north slope of the Sixmile Creek gorge. From there the rate of dip appears to increase, so that boring A-3 was progressed to Elev. 640 without encountering bedrock. Seismic points in this area indicated bedrock to occur between Elev. 600 and 640. In the area of the gully at the south end of the dam, the bedrock surface rises again, to Elev. 672 at seismic point SP-13 and Elev. 718 at seismic point SP-14.

Boring A-1, on the left bank of the gully eroded by the small tributary stream, disclosed a soil profile entirely different from that found in the other borings. The surface soil to a depth of 38 feet is a medium compact to very compact material composed mainly of silt with lesser quantities of fine sand and clay and shale fragments. A very pervious uniform sand, possibly a delta deposit, was found between depths of 38 and 75 feet. The boring was stopped at a depth of 75.7 feet in very compact sand, gravel, and silt, possibly the very compact bouldery glacial till found in other borings at this site.

Groundwater was observed only in borings A-1 and A-2, at depths of 10 and 30 feet, respectively. However, based on the change in the color of the silt and clay deposit, in our opinion the static groundwater level at borings A-2, A-3, and A-4 is at a depth of approximately 20 feet.

3. EFFECTS OF SITE CONDITIONS ON PROJECT

3.1 Downstream Hazard

Two miles downstream from the proposed project sites, Sixmile Creek leaves a narrow gorge to flow between a hillside and a flat alluvial fan, occupied by a relatively densely populated area of the city of Ithaca. Because of this fact, greater care than usual must be taken in foundation investigations, and the design and construction of the project.

3.2 Stability of Reservoir Shoreline

The fine-grained glacial lake deposits that are present on the sides of the creek valley have a low shearing strength and are subject to sliding on even moderate slopes. Traces of old and recent landslides can be seen throughout this area. Eventually all clay slopes subject to seepage tend to assume an angle of about 10 degrees. This is an extremely slow process however, frequently requiring many hundreds of years.

The frequency of slope failures will be increased only slightly by the newly impounded reservoir. The adverse effects on the stability of the slopes resulting from wave action and buoyancy at the bottom of the slope will be counteracted to some extent by the reduction of the hydraulic gradient in the slope.

The potential amount of material that could slide into the reservoir will be very small in comparison with the volume of the reservoir. The reduction in reservoir capacity from this source, or the sudden rise in reservoir water level as a result of a slide, is considered to be insignificant. Some muddying of reservoir waters will occur, but it is expected to be minor when compared to that which could result from any extensive grading of the shoreline.

Slide material should not be permitted to block the outlet works or the spillway. This should be taken into account in locating these facilities and in designing slopes in their vicinity.

In summary, it is not considered to be practical or necessary to flatten all silt and clay slopes around the periphery of the reservoir to an ultimately stable slope.

3.3 Bethel Grove Site

3.3.1 Removal of Low-Strength Soils

Soft to firm silts and clays make up the surface soils at both abutments of the proposed dam. Because of their assumed low strength, these materials will most likely have to be removed under parts of the dam to insure its stability. The anticipated extent of excavation that will be required in these soils is shown in Drawing No. 3SM 1819D. Permanent excavation slopes will have to be made very flat to insure stability after filling of the reservoir and to reduce differential settlements where the embankment is founded on the compressible soils. The actual required extent of excavation and the side slopes will have to be determined in the design stage when more complete information becomes available. The excavation layout shown in 3SM 1819D can be used for the purposes of an economic analysis and comparison.

3.3.2 Foundation Seepage Control

Seepage through the pervious deposit encountered in the upper 42 feet of boring B-5 will have to be controlled by either constructing a cut-off through this deposit or by placing an impervious blanket over it for some distance upstream of the dam. The excavated gray silts and clays may be suitable for this purpose. The method should be selected in the design stage based on a more complete subsurface exploration program.

On the basis of presently available information, the bouldery glacial till, found below a depth of 42 feet in boring B-5 and underlying the silts and clays in other borings, is considered to be sufficiently impervious that a complete cut-off will not be required through it. However, this material should be investigated in greater detail in design. Where the dam is placed directly on this material, a shallow core trench will have to be excavated in this material to an assumed depth of 5 feet. This will serve to "key" the embankment to the foundation, preventing a seepage path along the contact between the embankment and the foundation.

Where the dam is to be founded on bedrock, the rock foundation can be expected to require the following treatment:

1. Excavation of a cut-off trench to intact rock.
2. Cleaning of the rock surface with water jets.

3. Filling of open cracks in the rock surface with a thick grout or a wet concrete. The lateral limits for this treatment are shown in Drawing No. 3SM 1819F.
4. Installation of a grout curtain to reduce seepage through the openings in the rock. For estimate purposes the grout holes can be assumed to be 60 feet deep, spaced at 5 feet center-to-center, and taking 0.2 sacks of cement per foot of depth in each hole. The anticipated lateral limits of the grout curtain are shown in Drawing No. 3SM 1819G.

3.3.3 Cross Section of Dam

A preliminary dam cross-section to be used for an economic analysis is shown in Drawing No. 3SM 1819F. The top width of 32 feet was shown in a layout dated October 1971, received from your office. The one vertical on two and one-half horizontal downstream slope and one vertical on three horizontal upstream slope shown in this layout are good preliminary estimates. Buttress fills, as shown in Drawing No. 3SM 1819G may be required at the right abutment, where the embankment will rest, in part, on the low-strength silts and clays.

For the time being, the dam can be assumed to be homogeneous. During the design stage, the cross-section of the dam can be modified based on an analysis of the availability of various types of borrow materials and of their strength and other properties.

The drainage blanket should consist of a processed granular material designed to prevent erosion of the adjacent material while having adequate permeability for the amount of flow it may be required to carry. The drainage blanket should be extended up into the body of the dam in the form of a "chimney drain" for the following reasons:

1. It provides a more positive way of intercepting seepage and, thereby, a margin of safety that is considered desirable because of the damage potential downstream of the dam.
2. The consideration that supporting the right end of the dam on compressible soils will lead to differential settlements which could cause the development of cracks in the dam. The chimney drain will still intercept seepage and help prevent progressive erosion, should a transverse crack occur in the dam.

To estimate the cost, the drainage blanket and chimney drain can be assumed as being 8 feet thick.

The depth of the cut-off or key trench will vary depending on the foundation conditions that will be disclosed by more detailed subsurface explorations and during construction.

For estimate purposes the upstream slope protection against wave action can be assumed to be an 18-inch layer of stone filling (medium), supported on a six-inch layer of bedding material. For a description of these materials, see N.Y.S. Department of Transportation Standard Specifications of January 2, 1973. The slope protection can be discontinued five feet below normal low water level. The downstream slope can be protected against surface erosion by topsoiling and seeding.

3.3.4 Spillway

The closest boring to the proposed location of the spillway control structure is B-1. Very compact silty material, that will provide adequate support for the structure, was found in this boring at a depth of 40 feet (Elev. 822). The boring was terminated at Elev. 784 without encountering bedrock. If the spillway control structure is placed on soil instead of rock, particular attention should be paid to controlling seepage around and under the structure, so that high hydraulic gradients would not cause piping or erosion. The location of the spillway may have to be adjusted during design to obtain a good foundation for the spillway chute. Provisions for seepage control and drainage will have to be included in the design of the chute, in order to control uplift forces and prevent erosion.

The ridge between the reservoir and spillway outlet channel is relatively narrow. The silty material found in boring B-1, although quite compact, will not be very erosion-resistant when saturated and exposed on a slope. There is little doubt that, after construction of the proposed dam and impoundment of the reservoir, the natural slope on the west side of the spillway outlet channel will become saturated to a considerable height. Therefore, a method, such as shown in Drawing No. 3SM 1819G, consisting of a triangular section of fill containing perforated underdrain pipe surrounded by filter material, will have to be used to keep the saturated soils weighted down and to collect seepage from the slope. The filter material will have to be similar to that used for the drainage blanket in the dam. The material placed over the filter material should be similar to the embankment material used in the dam.

3.4 Alternate Site

3.4.1 Removal of Soft Soils

Based on the information available from borings A-2 and A-3, the knob of land crossed by the axis of the proposed dam consists, above Elev. 740, mainly of soft to firm silts and clays. Considering their assumed low strength and the topography of the knob, the dam cannot be constructed on these soils with any certainty that it will be stable. Therefore, we anticipate that the silts and clays will have to be removed for their full depth and for such a width as to permit the dam to be constructed across the knob on a foundation of compact glacial till. The anticipated limits of removal are shown in Drawing No. 3SM 1819E. The excavation slope in the silts and clays downstream of the dam can be made steeper than elsewhere, because filling of the reservoir will not affect its stability and a slope failure here would not endanger the dam.

A smaller deposit of silts and clays is found at the right abutment of the dam. This should also be removed and sloped back as shown in Drawing No. 3SM 1819E. At this stage total removal appears to be more economical than partial removal and construction of buttress fills. Approximate limits of removal are shown on this drawing to permit an estimate of the quantity of removal.

3.4.2 Flattening of Steep Slopes

At the proposed Alternate Site for the dam, Sixmile Creek flows in a steep-sided gorge. Steep abutments are not desirable for an earth dam for the following reasons:

1. It is difficult to get good contact between the embankment and the rock face of the abutment when compacting against a steep jagged slope.
2. Differential settlement within the dam, caused by abrupt changes in the height of the dam, can lead to cracking.

Therefore all natural slopes beneath the dam should be flattened to an inclination not steeper than 1 on 1.

3.4.3 Foundation Seepage Control

The pervious sand deposit found in boring A-1 will require special treatment. It cannot be ascertained from the available information whether this deposit occurs at ground surface below the level of the proposed reservoir and, if so, over how large an area. Depending on the findings of a more detailed investigation in the design phase, a deep cut-off, an impervious upstream blanket combined with relief wells downstream of the dam, or just relief wells may be required.

Elsewhere, where the dam is constructed on compact and relatively impervious soils, a minimum five feet deep key trench will be required. Where the dam is founded on rock the trench should extend to intact rock.

The rock foundation in contact with the impervious material near the central part of the dam will have to be cleaned with high pressure water jets. Subsequent to the cleaning, open fissures and cracks in the rock should be filled with thick grout to prevent loss of fine-grained materials into the rock. The steep rock slopes will probably have to be gunited. Limits for this treatment are shown in Drawing No. 3SM 1819F. A grout curtain will be required in the rock. The anticipated lateral limits of the grout curtain are shown in Drawing No. 3SM 1819H. For estimate purposes, it can be assumed that the grout holes will be 60 feet deep, spaced at five-foot intervals, and that the average grout take will be 0.2 bags of cement per linear foot of grout hole.

3.4.4 Cross-section of Dam

A crest width of 32 feet, the same as shown in a layout for the Bethel Grove Site, was assumed also for the proposed dam at the Alternate Site. The side slopes of 1 vertical on 3 horizontal upstream and 1 vertical on 2½ horizontal downstream as shown by your office, are appropriate at this stage. The actual side slopes should be based on a detailed analysis during design.

In general, the same considerations regarding the cross-section of the dam as at the Bethel Grove Site apply. The homogeneous earth dam shown should be subject to review based on an analysis of the availability of various types of embankment materials during the design stage. If a zoned dam is selected, the thickness of the impervious core may have to be increased where it contacts the steep rock abutments.

The drainage blanket under the downstream portion of the dam should be extended up into the body of the dam as a "chimney drain" for the additional safety it provides. The preliminary dimensions and limits of the chimney drain and drainage blanket are shown in Drawing No. 3SM 1819F.

The possibility of transverse cracking in the upper part of the dam, as a result of the steep valley sides, should be given careful thought in the design. Some of the precautionary measures that might be employed are:

1. Careful selection and control of materials and construction procedures to minimize cracking.
2. Widening of drainage zones in the critical areas to enable them to carry increased flow if cracking occurs.
3. Scheduling of embankment construction to minimize differential settlements.

The same type of material as that described for the Bethel Grove Site will provide adequate protection of the upstream slope against wave action. The downstream slope can be protected against erosion by topsoiling and seeding.

3.4.5 Spillway

A modified spillway layout is shown in Drawing No. 3SM 1819H. The main modification has been an increase in the width of the approach channel to reduce the velocity and improve the efficiency of the spillway. A side channel spillway should be considered, if it is found that the cut slopes for the proposed alignment encroach on the adjacent highway. If a bridge is to be built across the spillway, a side channel spillway will require a shorter structure.

Tentatively we have assumed a stilling basin at about elevation 750. The flow from the stilling basin to the creek channel would be uncontrolled down the rock slope, except for a training wall at the bottom of the slope, directing flow away from the dam.

Cut slopes in this type of rock are usually designed at an inclination of 1 vertical on 1 horizontal. The excavation for the spillway will be partly in earth and partly in rock. Therefore an average inclination for rock and soil of 1 vertical on 2 horizontal can be assumed for the spillway cut slopes for preliminary estimate purposes.

3.4.6 Considerations for Concrete Dam

For the concrete dam scheme transmitted with your cost estimates of October 10, 1971, the recommendations for foundation treatment discussed for an earth dam generally apply with the following exceptions:

1. The highest part of the dam will be constructed as a concrete gravity dam.
2. The proposed spillway in the right abutment will be eliminated. Instead, the concrete dam is provided with a central overflow section.
3. Special treatment will be required at the junction between the concrete and the earth fill sections of the dam.

The subsurface explorations indicate that bedrock at the Alternate Site occurs at a lower elevation than assumed in the upstream elevation of the concrete dam scheme included with your cost estimates. Based on very limited data, it is anticipated that the average depth to suitable rock on which to found the concrete dam will be about 10 feet below bedrock surface.

Critical locations for the safety of the project will be the junctions between the concrete dam and the abutting earth fill sections. An adequate system of cut-offs and drains should be provided here to minimize the quantity of seepage, prevent piping, and control hydrostatic pressures in the fills.

A grout curtain similar to that for the earth dam alternates discussed above will be necessary below the dam, near the upstream toe. The lateral limits of the grout curtain are indicated in Drawing No. 3SM 1819H. A line of drainage holes should be provided just downstream of the grout curtain, in order to reduce uplift pressures under the dam. A drainage gallery should be included in the body of the dam. This gallery will collect drainage from the drainage holes and facilitate additional grouting if such should prove necessary.

3.5 Availability of Construction Materials

Impervious soil for the embankment will be available; at least in part, from required excavation. If additional impervious material is required, glacial till would be the optimum material for a homogeneous dam because of its low permeability and high strength. Pervious materials for a zoned dam are available from terrace deposits in the proposed reservoir area.

The filter material for the drainage blanket in the dam will require high-quality gravel. Such gravel is available at Brooktondale, 3 or 4 miles southeast of the proposed damsites. This gravel, however, will most probably require processing to obtain the required gradation.

The stone used for protecting the upstream slope against wave action has to be highly resistant to weathering. The nearest known source of acceptable stone is the Cayuga Crushed Stone Corp. quarry south of Ludlowville.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 General

The need for a reservoir at this location should be weighed carefully against the potential damage downstream in case of a failure.

4.2 Required Foundation Treatment

The difficult foundation conditions existing at the two sites under consideration will dictate special treatment to insure the safety of the dam. A preliminary appraisal of the required treatment is described above and summarized below. The actual treatment should be based on extensive analyses of stability, settlement, and seepage. This treatment will add materially to the cost of this project and should be included in the cost estimates when evaluating the feasibility of the project. For the most part, the types of required treatment are similar at the two sites.

1. Removal and sloping back of low-strength foundation soils. The gray silts and clays should not be considered as potential embankment material.
2. Flattening of rock slopes beneath the dam at the Alternate Site to not steeper than 1 on 1.
3. Surface grouting and/or guniting of fissures in the surface of the rock foundation.
4. Cut-offs through pervious materials. This is an item which may be very expensive but regarding the extent of which we have comparatively little information. Shallow key trenches will be sufficient in other materials.

5. Grout curtain in rock where the dam is on a rock foundation.
6. A chimney drain in the dam.
7. Cut-offs and collector drains for the spillway control structure at the Bethel Grove Site.
8. A seepage collection and slope stabilizing system for the slope on the west side of the spillway chute and outlet channel at the Bethel Grove Site.
9. Cut-offs and collector drains at the junction between concrete and earthfill sections if a concrete dam is considered for the Alternate Site.

4.3 Subsurface Investigation Program for Design

The subsurface investigation program for the design of this project should be planned so as to:

1. Measure those properties of the subsurface deposits that will affect the design and performance of the project. To accomplish this, the following will be required:
 - a. Borings to obtain soil samples and rock cores for identification and testing.
 - b. Test pits and trenches to examine and sample materials, such as the bouldery glacial till, that cannot be sampled satisfactorily using small-diameter equipment.
 - c. Field permeability tests in soils and bedrock.
 - d. The use of a bore hole camera to investigate zones in rock that exhibit poor core recovery.
2. Delineate adequately the boundaries between the different foundation strata. This will require:
 - a. A combination of surface reconnaissance, borings, and test trenches to find the surface and subsurface contacts between the foundation strata.

- b. A flexible program, with the information available at any one time used to determine the location of further explorations.
 - c. Close cooperation between the drill crews and the designer. It is recommended that the designer personally oversee the subsurface exploration program in the field.
3. Determine the properties of construction materials, including those that will have to be brought in from sources off the site and the extent of these sources. An analysis of the types of materials available on site will indicate what materials will have to be imported. The U.S. Department of Agriculture Soil Survey report will be of value in locating sources of construction materials. Laboratory tests should be performed on the materials to ascertain their suitability for their intended use and to obtain data for use in design.



APPENDIX

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-2
LINE & STA. _____
See Coordinates below
OFFSET _____

PROJECT CAYUGA LAKE BASIN - SIX MILE CREEK DAM SITE
QUAD. LOCATION 15/1/32 DATE, START 11/12/71 SURF. ELEV. 809.1
SOIL SERIES DUNKIRK DATE, FINISH 12/23/71 DEPTH TO WATER -30.0 ft
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL _____
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	ON BLOWS CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
0	12											N 880,500
	32											E 532,100
	18											
	12											
5	11											
	16	J-1	2	2							SILT & GRAVEL, SO.	
	14				3					D BR	SAND (FRIABLE)	6.0'-6.5'
	17											
	13											
	12											
10	15	J-2	2	2							D BR GRAVEL, SO. SILT & SAND	10.0'-11.5'
	15				3							
	16											
	14											
	12											
15	32	J-3	7	7							D BR GRAVEL, SO. SILT & SAND	15.0'-16.5'
	25				8							
	53											
	42											
20	32		4	5							LOST SAMPLE	20.0'-21.5'
	41				6							
	43											
	47											
25	49										SILT, TR. CLAY, SAND	
	45	J-4	3	5						M GR	& GRAVEL	25.0'-26.5'
	48				4							
	48											
	76											
30	81											
	65	J-5	9	7							M GR SILT, TR. CLAY	30.0'-31.5'
	85				7							
	69											
	82											
35	78											
	71	J-6	2	3							W GR SILT, SO. CLAY	35.0'-36.5'
	90				3							
	66											
	72											
	72											
40	66	J-7	3	3							W GR SILT, SO. CLAY, TR. SAND	40.0'-41.5'
	72				3							
	55											
	56											
45	63										M.C. = 24.5 %	
	60	J-8	1	2							SILT, SO. CLAY, TR.	
	56				2					W GR	FINE GRAVEL	45.0'-46.5'
	56											
	47											
50	45											

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 3. HOLE NO. A-2



DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-2
LINE & STA. _____
SEE COORDINATES BELOW
OFFSET _____

PROJECT CAYUGA LAKE BASIN - SIX MILE CREEK DAM SITE
QUAD. LOCATION T5/1/3 32 DATE, START 11/12/71 SURF. ELEV. 809.1
SOIL SERIES DUNKIRK DATE, FINISH 12/23/71 DEPTH TO WATER -30.0 ft.
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL _____
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24					
50	56	J-9	2	2						W BR CLAY & SILT	N 880,500 E 532,100 50.0'-51.5'
	54				2						
	40										
	53										
	62										
55	81	J-10	1	1						SILT, SO. CLAY, TR. GRAVEL	55.0'-56.5'
	79				2						
	71										
	53										
60	60										
	69	J-11	2	3						W BR SILT, SO. CLAY	60.0'-61.5'
	64				3						
	65										
	85									(TILL)	
65	67									SILT, SO. FINETONED.	
	54	J-12	48	59						M BR GRAVEL & SAND, TR. CLAY	65.0'-66.5'
	76				84						
	64									(SANDY TILL)	
	135										
70	80									SILT & SAND, SO. FINE	
	106	J-13	16	54						M BR GRAVEL, TR. CLAY	70.0'-71.5'
	86				67						DRILLED WITH QUARRY BIT: 71.5 TO 75.0'
	77									(TILL)	
	111										
75	75	J-14	100/3"							SILT & FINE SAND, SO. GRAVEL, TR. CLAY	75.0'-75.3'
	100										DRILLED WITH QUARRY BIT: 75.3'-80.0'
	120										
	95										
	110										
80	66		100/3"							LOST SAMPLE	80.0'-80.5'
	122										DRILLED WITH QUARRY BIT: 80.5'-85.0'
	80										
	80										
	96									FINE TONED GRAVEL &	
85	83									W BR SILT, SO. SAND, TR. CLAY	85.0'-86.0'
	122	J-15	69	100							DRILLED WITH "AX" DIAMOND BIT: REC: 6" 7 PCS.
	106										86.0'-90.0'
	90									GRY Limestone BOULDERS	
	89									SILT & GRAVEL, SO.	
90	88	J-16	DRILLED							W GRY SAND, TR. CLAY	90.0'-91.5' ("E" SPOON) QUARRY BIT REFUSED
	8540	J-17	61	76							DRILLED WITH "AX" DIAMOND BIT: REC: 6" SEVERAL PCS.
	1500				98						91.5'-96.0'
	130									GRY Limestone BOULDERS	
	300									SILT, SO. GRAVEL, TR.	
95	320									W GRY SAND & CLAY	96.0'-97.5' ("E" SPOON)
	360	J-18	DRILLED								
	365	J-19	45	75							
	510				86						
	125										
100	136										

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
F.
SHEET 2 OF 3. HOLE NO. A-2

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-2
LINE & STA. SEE COORDINATES BELOW
OFFSET

PROJECT CAYUGA LAKE BASIN - SIX MILE CREEK DAMSITE
QUAD. LOCATION T5/1/34 32 DATE, START 11/12/71 SURF. ELEV. 809.1
SOIL SERIES DUNKIRK DATE, FINISH 12/23/71 DEPTH TO WATER -30.0ft
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH DOWN SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS N 880,500 E 532,100
			0	6	12	18	24					
0	146	J-20	27	56								
	184				92					W GR	SILT	100.0' - 101.5' (E" Spoon)
	202											
	188											
105	2000											
	165											
	435											
	285											
	980											
110	431	J-21	41	100	5"						SILT, TR. FINE GRAVEL & FINE SAND	110.0' - 110.9' (E" Spoon)
	941									W BR	REC: 2" 4 PIECES	DRILLED WITH
	913	J-22	DRILLED							GRY	LIMESTONE BOULDERS	110.9' - 112.4' "AX" DIAMOND
	1152											
	1017											
115	983											
	749											
	702											
	491											
	456											
120	379											
	291											
	631											
	2476											
	1970											
	651											
125	522											
	300											
	322											
	391											
130	4980	J-23	DRILLED							GRY	LIMESTONE BOULDERS	112.4' - 130.0'
		J-24	57	68						W BR	SILT & COARSE SAND, TR. MEDIUM GRAVEL	130.0' - 131.4' "E" Spoon
					100	14"						
135												
140												
145												
150		J-25	DRILLED								BOTTOM OF HOLE @ 150.0' - P	

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DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 3 OF 3 HOLE NO. A-2

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. 1030070

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-3
LINE & STA. 4820.865
OFFSETS 532.4 TO

PROJECT CAYUGA LAKE BASIN (6 MILE CREEK DAM SITE)

QUAD. LOCATION 75/1/36 32 DATE, START 1-6-72 SURF. ELEV. 793.2

SOIL SERIES DUNKIRK DATE, FINISH 2-9-72 DEPTH TO WATER OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS OR CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24					
0	12										
	25										
	34										
	41										
	46										
5	59	J-1	11	9				82%	M BR	VARVED SILT	5.0'-6.5'
	25				8						
	34										
	47										
10	41										
	46	J-2	6	8					W BR	SILT, TR. CLAY	10.0'-11.5'
	47				10						
	43										
	66										
15	94										
	43	J-3	12	10					W BR	SILT	15.0'-16.5'
	21				10						
	19										
	21										WOH = WEIGHT OF HAMMER
20	18										
	32	J-4	1						W GR	SILT, SO. CLAY, TR. GRAVEL	20.0'-21.5'
	27				2						
	26										
	24										
25	28										
	32	J-5	1	1					W GR	SILT, TR. CLAY & GRAVEL	25.0'-26.5'
	21				1						
	24										
	24										
30	28										
	22	J-6	1	2					W GR	SILT, SO. CLAY, TR. FINE GRAVEL	30.0'-31.5'
	27				1						
	28										
	24										
35	25										
	42	J-7	1	1					W GR	SILT, SO. CLAY	35.0'-36.5'
	45				2						
	52										
	54										
	67										
40	77	J-8	1	2					W GR	SILT & CLAY	40.0'-41.5'
	91				1						
	75										
	74										
45	78										
	78	J-9	2	1					W GR	SILT, TR. CLAY	45.0'-46.5'
	77				2						
	77										
	77										
50	78										

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ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 3. HOLE NO. A-3

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. 10300-70

PROJECT CAYUGA LAKE BASIN (6 MILE CREEK DAM SITE)
QUAD. LOCATION 15/13/32 DATE, START 1-6-72 SURF. ELEV. 793.2
SOIL SERIES Dunkirk DATE, FINISH 2-9-72 DEPTH TO WATER OBSERVED ^{NOTE}
(ALSO DESCRIBE UNDER "REMARKS")

CASING	O.D. <u>2.75</u>	I.D. <u>2.25</u>	WEIGHT OF HAMMER <u>300 lbs.</u>	HAMMER FALL
SAMPLER	O.D. <u>2.00</u>	I.D. <u>1.50</u>	INSIDE LENGTH OF SAMPLER <u>18"</u>	CASING <u>18"</u> SAMPLER <u>18"</u>

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ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 2 OF 3 HOLE NO. A-3

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. 1030070

STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
BUREAU OF SOIL MECHANICS
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-3
LINE & STA. N 860.865
OFFSETE 532.470

PROJECT CAYUGA LAKE BASIN (6 MILE CREEK DAMSITE)

QUAD. LOCATION T51/7632 DATE, START 1-6-72 SURF. ELEV. 793.2
SOIL SERIES DONKIEK DATE, FINISH 2-9-72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					GROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24	24-30					
0	1											DRILLED WITH "AX" DIAMOND BIT TO 150.0'
105												
110												
115												
120												
125												
130												
135												
140												
145												
150												

RECOVERED ASSORTED
BOULDERS

REC: 21"
5 PCS. 4 CHPS. 80.0'-150.0'

BOTTOM OF HOLE @ 150.0' D

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 3 OF 3 HOLE NO. A-3

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10.300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-4
LINE & STA. 6+00
OFFSET 810' RT.

PROJECT CANUGA LAKE BASIN: SIX MILE CREEK DAM SITE
QUAD. LOCATION 75-1-432 DATE, START 14 June 72 SURF. ELEV. 786.0'
SOIL SERIES Quaker DATE, FINISH 28 June 72 DEPTH TO WATER None Observed
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

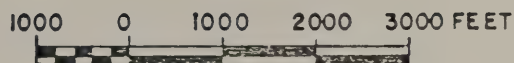
DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24	24					
0												
10												
16												
20												
21												
17	J-1	6	7						M Br.		Dense Silt, trace of weathered shale, slightly Plastic.	5.0' ~ 6.5'
19					8							
26												
28												
36												
56	J-2	7	12						M Br.		Dense Silt, slightly Plastic.	10.0' ~ 11.5'
56					12							
55												
45												
47												
12	J-3	6	8						M Br.		Dense Silt, trace of Fine Sand.	15.0' ~ 16.5'
96					11							
102												
92												
80												
70	J-4	2	2						w Grp.		Silt, Some Clay.	20.0' ~ 21.5'
94					4							
78												
70												
61												
45	J-5	1	1						w Grp.		Silt, Some Clay.	25.0' ~ 26.5'
98					4							
107												
93												
103												
56	J-6	5	8						w Grp.		Silt, Some Clay, to Gravel & Sand, tr. Clay.	30.0' ~ 31.5'
50					47							
60												
75	C-7 Drilled							0			Sandstone Boulders	Drilled with "AX" Diamond bit 32.6' ~ 35.0' REC. = 5" 3PCS. + Frags.
87												
197	J-8	21	52						M Grp.		Fine Gravel & coarse Sand So. Silt, tr. weat. shale pgs.	35.0' ~ 36.5'
175					77							
250												
	C-9 Drilled							1			Grp Sandstone & Shale	Drilled with "AX" Diamond bit 36.5' ~ 40.0' REC. = 3" 1PCS + Frags.
								1				
								1				
								1			Sand stone &	Drilled with "AX" Diamond bit 40.0' ~ 45.0' REC. = 22"
	C-10 Drilled							1			Grp Limey Sandstone	12PCS + Frags.
								1				
								1				
								1			Sandstone &	Drilled with "AX" Diamond bit 45.0' ~ 50.0' REC. = 18"
								1				
	C-11 Drilled							1			Grp Limey Sandstone	6PCS. + Frags.

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS J. F. DesChambeau
ROCK DESCRIPTIONS B. L. Dawson
DISTRICT SOILS ENGR. J. E. Christopher
SHEET 1 OF 2 HOLE NO. A-4



SCALE



CONTOUR INTERVAL 10 FEET

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

BUREAU OF SOIL MECHANICS

CAYUGA LAKE BASIN
SIXMILE CREEK
P.I.N. E103.00.701.02

SITE LOCATION PLAN

APPROVED JULY 13 1971

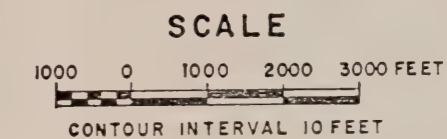
L. H. Wilcox

DIRECTOR

REGION NO. 3

COUNTY TOMPKINS

DRAWING NO. 3 SM 1819A



STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

BUREAU OF SOIL MECHANICS

CAYUGA LAKE BASIN
SIXMILE CREEK
P.I.N. E103.00.701.02

SITE LOCATION PLAN

APPROVED JULY 13 1921
L. H. Wilson
DIRECTOR

REGION NO. 3
COUNTY TOMPKINS
DRAWING NO 3 SM 1819A

EXISTING GROUND SURFACE

____900

SP-3

____800

____700

____600

ELEVATION-FT.

S
(BORINGS P
VERTICAL AN

DHB-1

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

SOILS MECHANICS BUREAU

CAYUGA LAKE BASIN
SIXMILE CREEK
BETHEL GROVE DAMSITE
P. I. N. E103.00.701.02
SUBSURFACE PROFILES

APPROVED JULY 13 1973

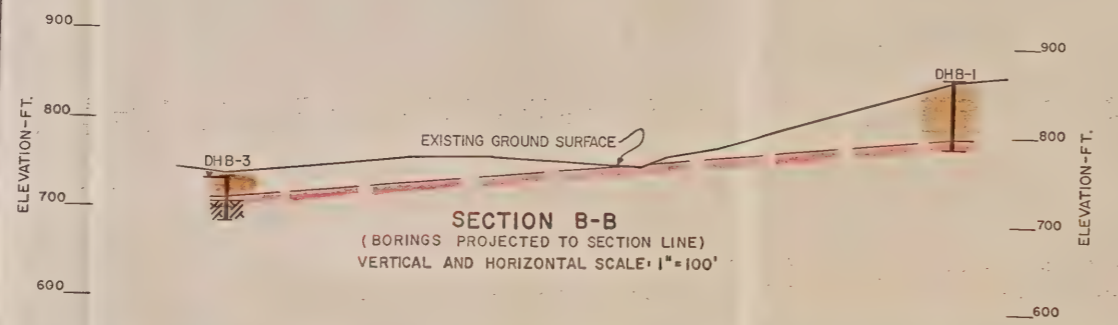
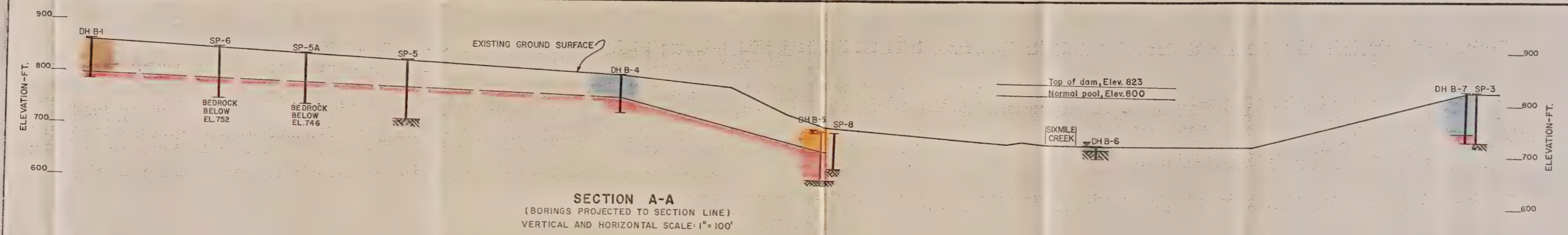
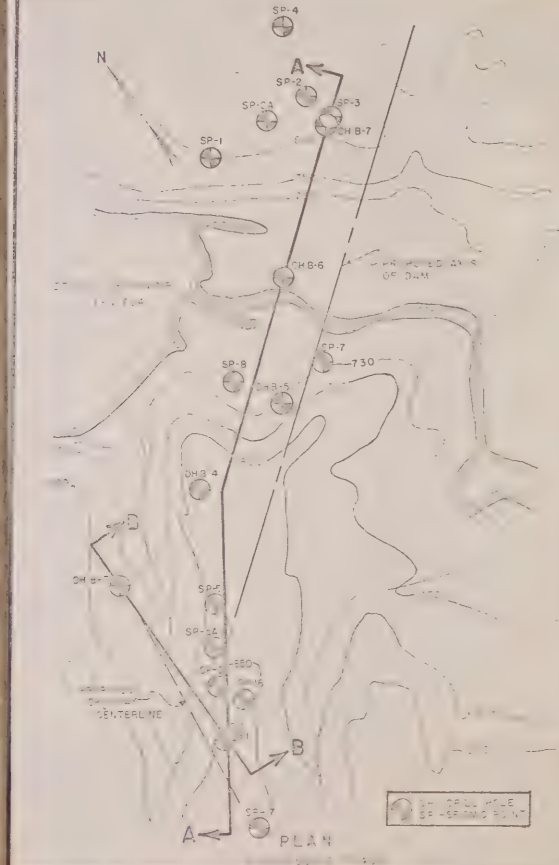
L. H. Moore

DIRECTOR

REGION NO. 3

COUNTY . TOMPKINS

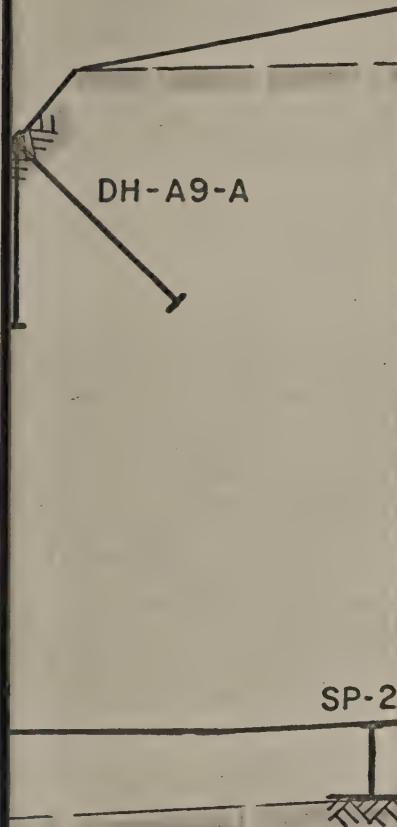
DRAWING NO. 3 SM 1819B



PREPARED BY: *Arthur R. Schum*
 DRAWN BY: *Joe Nailor*
 CHECKED BY: *Arthur R. Schum*

LEGEND	
SP	Seismic Point
DH	Drill Hole
	Observed Water Level
	Alluvium (assorted materials, ranging from silts to coarse gravels).
	Soft to stiff layered silts and clays.
	Compact to very compact mixtures of silts and fine sands, with lesser amounts of gravel and clay.
	Compact gravel with small amounts of sand and silt.
	Very compact mixtures of sand, gravel, silt and clay with numerous boulders (bouldery glacial till).
	Bedrock

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION	
SOILS MECHANICS BUREAU	
CAYUGA LAKE BASIN SIXMILE CREEK BETHEL GROVE DAMSITE P.I.N. E103.00.701.02 SUBSURFACE PROFILES	
APPROVED: <i>L.H. Moore</i> DIRECTOR	REGION NO. 3 COUNTY: TOMPKINS DRAWING NO. 3 SM1819B



STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOILS MECHANICS BUREAU

CAYUGA LAKE BASIN
SIXMILE CREEK
ALTERNATE DAMSITE
P.I.N. E103.00.701.02

SUBSURFACE PROFILES

APPROVED *JULY 13 1973*

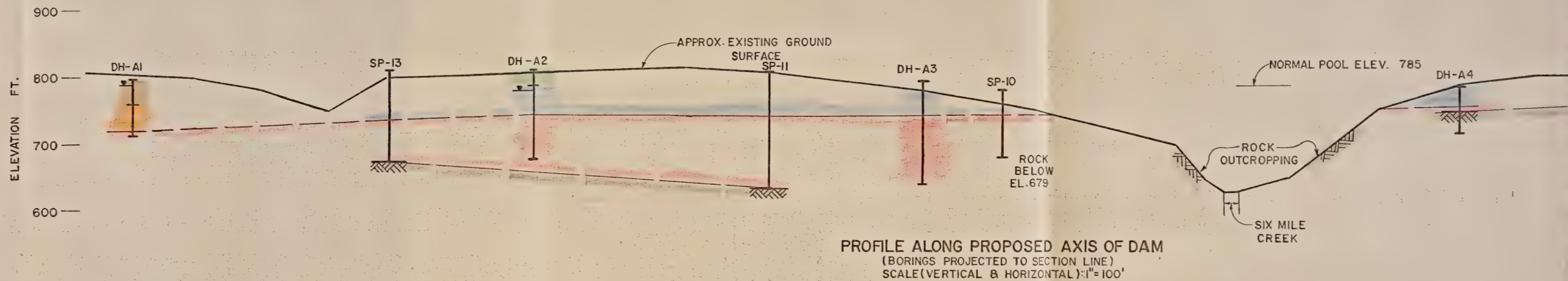
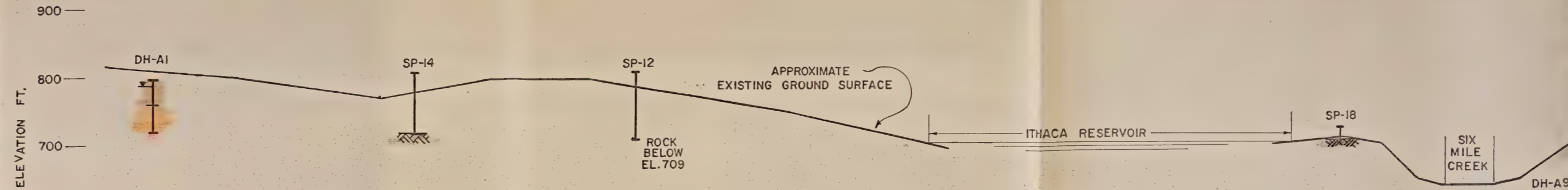
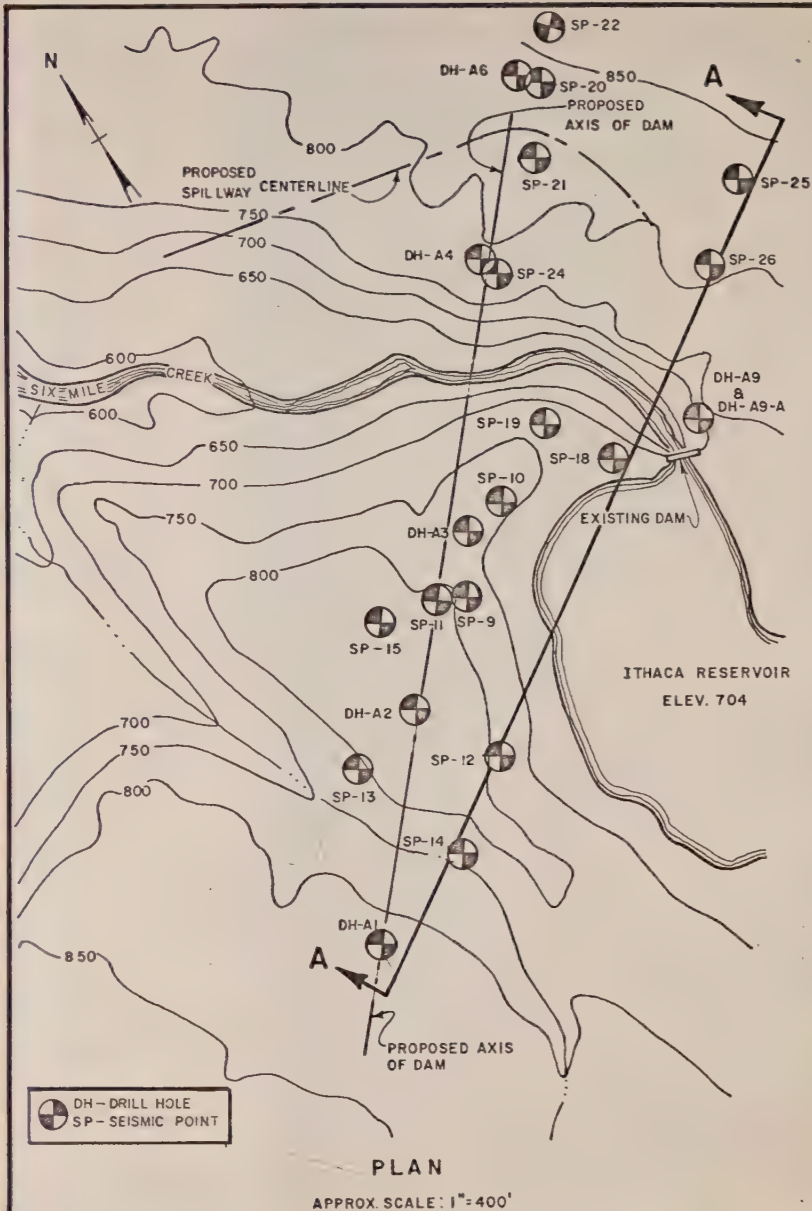
L. H. Moore

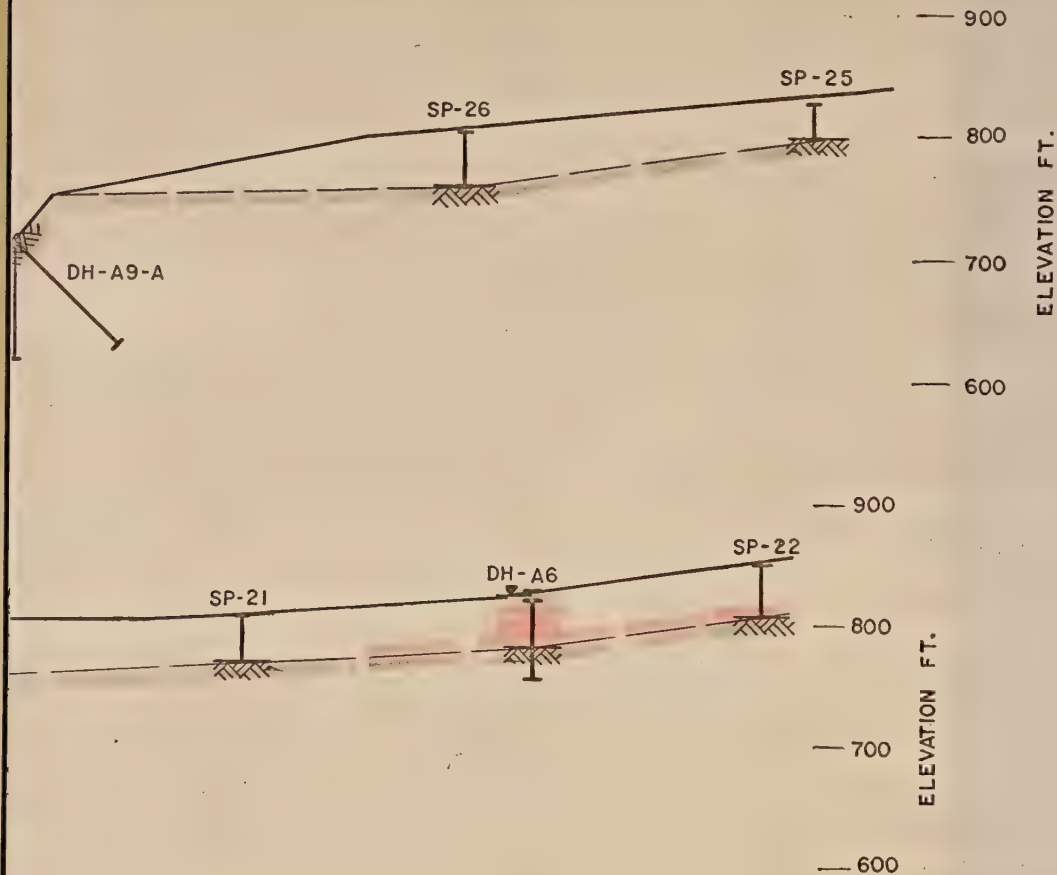
DIRECTOR

REGION NO. 3

COUNTY TOMPKINS

DRAWING NO. 3 SM 1819 C





PREPARED BY: *Arthur R. Schumacher*
 DRAWN BY: *Paul A. Rogers*
 CHECKED BY: *Arthur R. Schumacher*

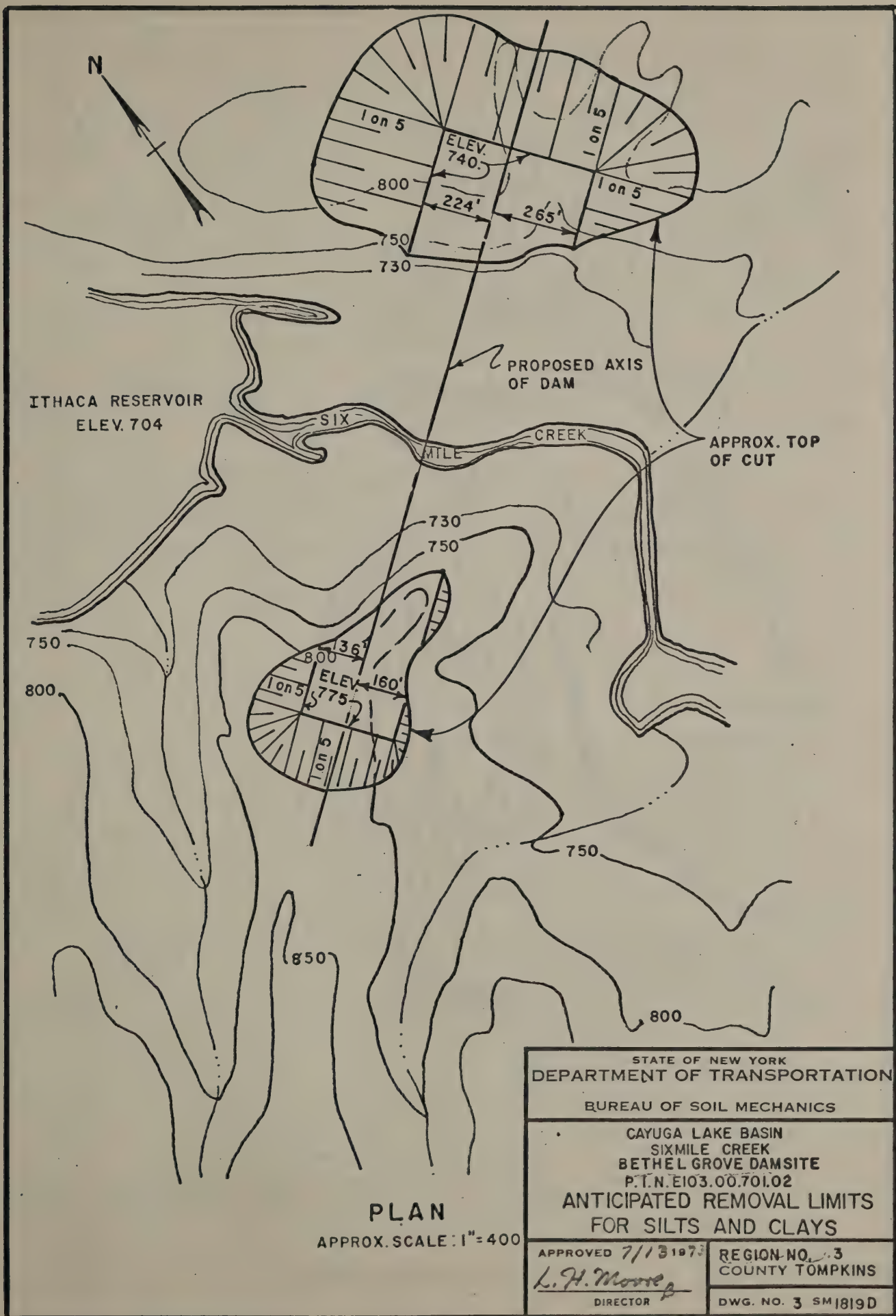
STATE OF NEW YORK
 DEPARTMENT OF TRANSPORTATION
 SOILS MECHANICS BUREAU

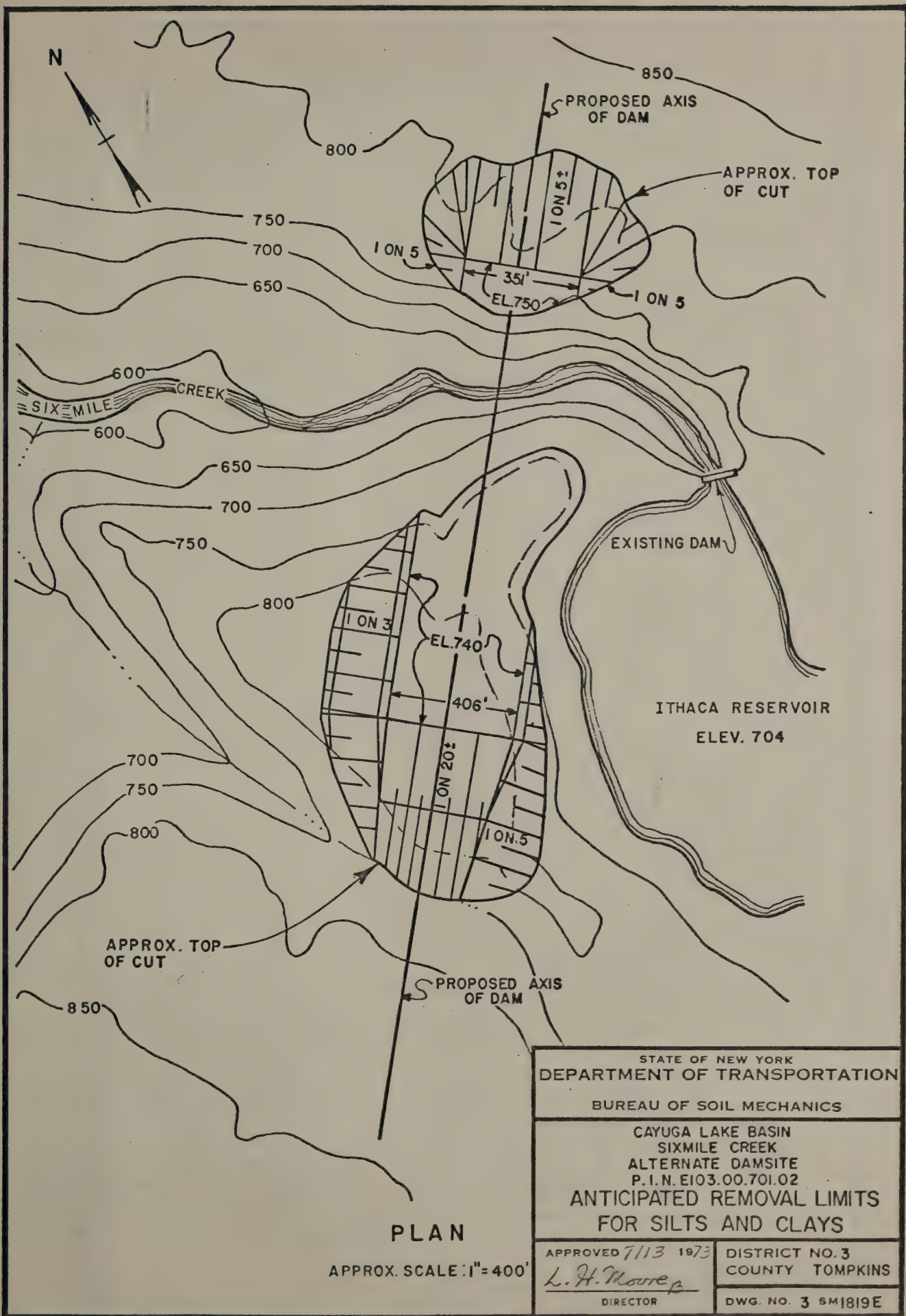
CAYUGA LAKE BASIN
 SIXMILE CREEK
 ALTERNATE DAMSITE
 P.I.N. E103.00.701.02

SUBSURFACE PROFILES

APPROVED *JULY 13 1973*
L. H. Moore
 DIRECTOR

REGION NO. 3
 COUNTY TOMPKINS
 DRAWING NO. 3 SM 1819 C





PLAN

APPROX. SCALE 1" = 400'

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
BUREAU OF SOIL MECHANICS

CAYUGA LAKE BASIN
SIXMILE CREEK
ALTERNATE DAMSITE
P.I.N. E103.00.701.02
ANTICIPATED REMOVAL LIMITS
FOR SILTS AND CLAYS

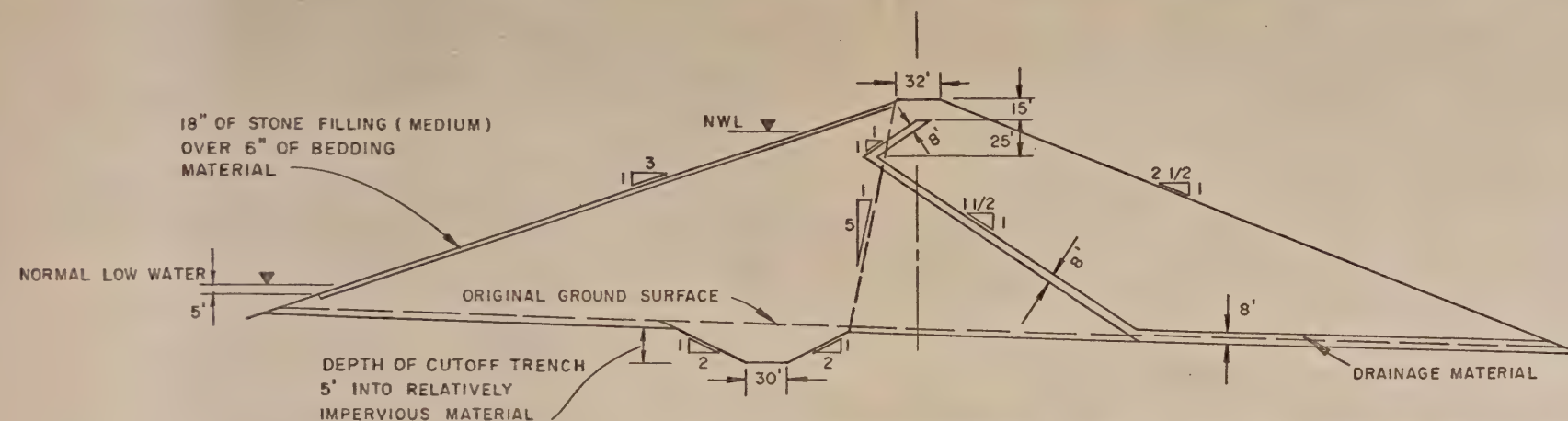
APPROVED 7/13/1973

L. H. Moore
DIRECTOR

DISTRICT NO. 3
COUNTY TOMPKINS

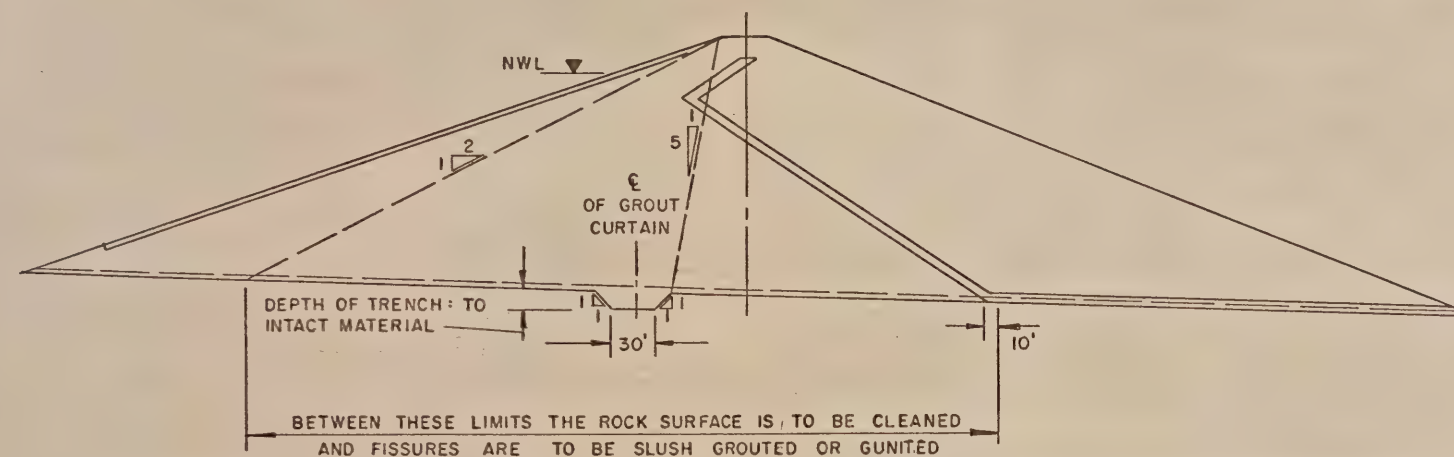
DWG. NO. 3 SM1819E





TYPICAL CROSS-SECTION OF DAM ON EARTH FOUNDATION

SCALE: 1" = 100'



TYPICAL CROSS-SECTION OF DAM ON ROCK FOUNDATION

SCALE: 1" = 100'

NOTE: MATERIALS, DIMENSIONS AND SLOPES SAME AS FOR DAM ON EARTH FOUNDATION, EXCEPT AS NOTED.

PREPARED BY: *Austero R. Schone*

DRAWN BY: *F. Agostino*

CHECKED BY: *Austero R. Schone*

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

SOILS MECHANICS BUREAU

CAYUGA LAKE BASIN
SIXMILE CREEK DAMSITES
P.I.N. E103.00-701-02

ASSUMED TYPICAL CROSS SECTIONS
FOR EARTH DAM

APPROVED *JULY 13 1973*

L.H. Moore

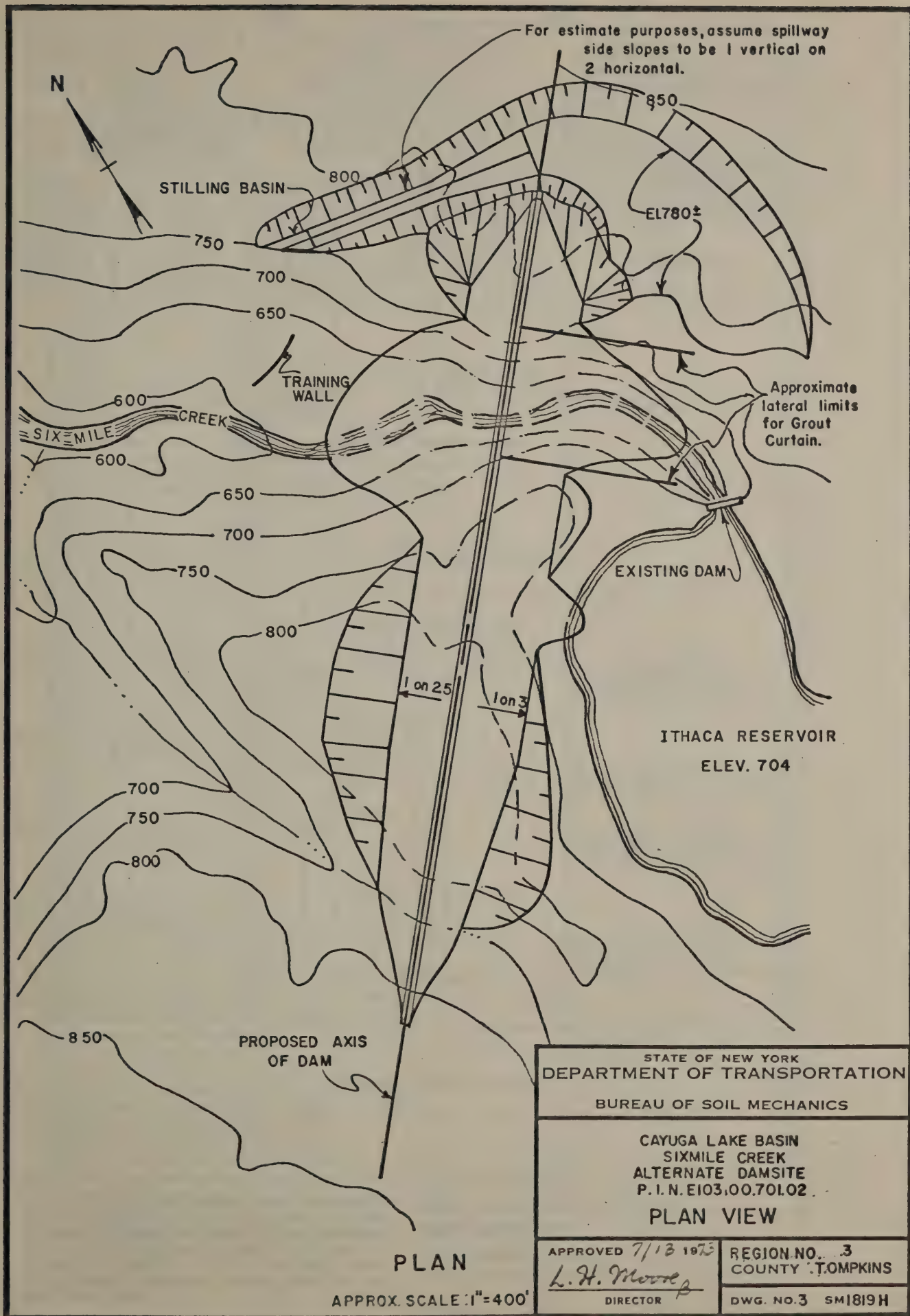
DIRECTOR

REGION NO. 3

COUNTY TOMPKINS

DRAWING NO. 3 SM 1819 F





STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

BUREAU OF SOIL MECHANICS

CAYUGA LAKE BASIN
SIXMILE CREEK
ALTERNATE DAMSITE
P.I.N. E103.00.701.02

PLAN VIEW

APPROVED 7/13 1973

L. H. Moore
DIRECTOR

REGION NO. 3
COUNTY TOMPKINS

DWG. NO. 3 SM1819H

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. E10300.701-02

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-1
LINE & STA. SEE COORDINATES BELOW
OFFSET

PROJECT CAYUGA LAKE BASIN ~ SIXMILE CREEK DAMSITE

QUAD. LOCATION 75-4-I17 DATE, START 17 MAY 72 SURF. ELEV. 797.7

SOIL. SERIES DUNKIRK DATE, FINISH 19 MAY 72 DEPTH TO WATER -10.0 FT.
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2 3/4" I.D. 2 1/4" WEIGHT OF HAMMER 300 lbs HAMMER FALL
SAMPLER O.D. 2" I.D. 1 1/2" INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24					
0	5										N 879, 745 E 531, 680
5	21										
	63										
	41										
	32										
	14	J-1	6	6				M	BR	SILT, some GRAVEL, trace Sand and Clay	5.0'-6.5'
	12				8						
	13										
	19										
10	22										
	52	J-2	6	6				W	BR GR	SHALEY GRAVEL and SAND, some Silt, trace Clay	10.0'-11.5' GW
	61				20						
	60										
	94										
15	113										
	42	J-3	17	20				W	GR	SILT and SHALEY GRAVEL, trace Sand and Clay	15.0'-16.5'
	53				17						
	68										
	140										
20	262										
	110	J-4	14	14				W	GR	GRAVEL and SAND, some Silt, trace Clay	20.0'-21.5'
	20				80						
	39										
	154										HAWTHORNE BIT AHEAD OF CASING 21.5' to 25.0'
25	287										
	104	J-5	25	30				W	GR	SAND and SILT, some Gravel	25.0'-26.5'
	111				52						
	66										
	180										HAWTHORNE BIT AHEAD OF CASING 26.5' to 30.0'
30	215										
	36	J-6	32	100	for 5"			W	GR	SAND, some Gravel, trace Silt	30.0'-30' 11"
	38										
	44										HAWTHORNE BIT AHEAD OF CASING 30' 11" to 35.0'
	80										
35	96										
	23	J-7	20	27				W	GR	GRAVEL and SAND, trace Silt	35.0'-36.5'
	27				30						
	46										
	76										
40	58										
	25	J-8	6	9				W	GR	MEDIUM SAND, trace Silt	40.0'-41.5'
	28				11						
	37										
	104										HAWTHORNE BIT AHEAD OF CASING 41.5' to 45.0'
45	88										
	27	J-9	4	7				W	GR	MEDIUM SAND, trace Silt	45.0'-46.5'
	36				9						
	68										
	56										
50	51										

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS J. SMALL
ROCK DESCRIPTIONS
DISTRICT SOILS ENGR. J.E. CHRISTOPHER
SHEET 1 OF 2 HOLE NO. A-1

HOLE NO. A-1
LINE & STA. _____
SEE COORDINATES BELOW
OFFSET _____

PROJECT CAYUGA LAKE BASIN ~ SIXMILE CREEK DAMSITE

QUAD. LOCATION 25-4-I 17 DATE, START 17 MAY 72 SURF. ELEV. 797.7
SOIL SERIES DUNKIRK DATE, FINISH 19 MAY 72 DEPTH TO WATER -10.0 ft.

CASING	O.D.	<u>2 3/4"</u>	I.D.	<u>2 1/4"</u>	WEIGHT OF HAMMER	<u>300 lbs</u>	HAMMER FALL
SAMPLER	O.D.	<u>2"</u>	I.D.	<u>1 1/2"</u>	INSIDE LENGTH OF SAMPLER	<u>18"</u>	CASING <u>18"</u> SAMPLER <u>18"</u>

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0 6	5 12	12 18	18 24	24					
50	32	J-10	5	10					GR BR	W	MED. SAND, trace silt	50.0'-51.5'
	41				12							
	52											
	74											
55	56										MEDIUM SAND, trace silt	
	21	J-11	7	15					GR BR	W		55.0'-56.5'
	33				14							
	54											
	61											
60	63										MEDIUM SAND, trace silt	
	39	J-12	5	9					GR	W		60.0'-61.5'
	45				14							
	59											
	66											
65	73										MEDIUM SAND, trace silt	
	42	J-13	7	10					GR	W		65.0'-66.5'
	61				14							
	75											
	80											
70	141										MEDIUM SAND, trace silt	
		J-14	12	15					GR	M		70.0'-71.5'
					16							
75											MED. SAND, trace silt CHANGING TO CEMENTED GRAVEL and COARSE SAND	HAWTHORNE BIT, 71.5' to 75.0'
		J-15	76	100 for 2"					GR	M		75.0'-75'8"
											↓ BOTTOM OF HOLE	AT 75'8"

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS J. SMALL
ROCK DESCRIPTIONS -
DISTRICT SOILS ENGR. J.E. CHRISTOPHER
SHEET 2 OF 2 . HOLE NO. A-1

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10,300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-4
LINE & STA. B 6+00
OFFSET 810' RT

PROJECT Cayuga Lake Basin: Stillme Creek Dam sites
QUAD. LOCATION 75-1-1/4 32 DATE, START 14 June 72 SURF. ELEV. 786.0'
SOIL SERIES Dunkirk DATE, FINISH 28 June 72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.56 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER	CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
50		J-12	100 = 2"			W Gry	Decomposed & weat. Shale	"E" Spoon 50.0 ~ 50.1
55		C-13	Drilled			Gry	Limey Sandstone	Drilled with "AX" Diamond bit 50.1 ~ 55.0'
60								Drilled with "AX" Diamond bit 55.0 ~ 65.0'
65		C-14	Drilled			Gry	Sandstone	REC = 7.5" 2 PCS. + frags.
70		C-15	Drilled				Sandstone	Drilled with "AX" Diamond bit 65.0 ~ 70.0'
75								REC = 5.5"
80								
85								
90								
95								
100								

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS J.F. DesChambeau
ROCK DESCRIPTIONS B.L. Dawson
DISTRICT SOILS ENGR. J.E. Christopher
SHEET 2 OF 2 HOLE NO. A-4

HOLE NO. A-6
LINE & STA. 1475
OFFSET 235' RT.

PROJECT CITY OF ITHACA - SIX MILE CREEK DAMSITE
QUAD. LOCATION 75-1-K31 DATE, START 6-5-72 SURF. ELEV. 825.2'
SOIL SERIES Dunkirk DATE, FINISH 6-13-72 DEPTH TO WATER -4.0'
(ALSO DESCRIBE UNDER "REMARKS")

CASING	O.D. <u>2.75</u>	I.D. <u>2.25</u>	WEIGHT OF HAMMER <u>300</u> lbs.	HAMMER FALL
SAMPLER	O.D. <u>2.00</u>	I.D. <u>1.50</u>	INSIDE LENGTH OF SAMPLER <u>18"</u>	CASING <u>18"</u> SAMPLER <u>18"</u>

DEPTH IN FEET SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0 6	6 12	12 18	18 24					
0	7										
	8										
	13										
	28										
5	27										
	6	J-1	2	2				(W) GR		SILT, SO. FINE SAND, TR. GRAVEL	5.0'-6.5'
	4				3						
	17										
	68										
10	140	J-2	100	1/4"				524 M GR		SILT, SAND & SHALEY GRAVEL	10.0'-10.3'
	2										DRILLED WITH "AX" DIAMOND BIT: REC: 5" 3 PCS.
	17										
	58										
	61										
15	41	J-3	DRILLED							ASSORTED BOULDERS	10.3'-15.0'
	75	J-4	37	44				524 M GR		SILT, SAND & GRAVEL	15.0'-16.5'
	31				40						DRILLED WITH "AX" DIAMOND BIT: REC: 6" PCS.
	42										
	236										
20	205	J-5	DRILLED							ASSORTED BOULDERS	16.5'-20.0'
	34	J-6	30	26				524 W GR		SILT, SAND & SHALEY GRAVEL	20.0'-21.5'
	28				38						DRILLED WITH "AX" DIAMOND BIT: REC: 5" PCS.
	105										
	130										
25	34	J-7	DRILLED							ASSORTED BOULDERS	21.5'-25.0'
	340	J-8	100	1/2"				524 W		SILT, SHALEY GRAVEL & SAND	25.0'-25.1'
	356										DRILLED WITH "AX" DIAMOND BIT: REC: 4" PCS.
	415										
	476										
30	73	J-9	DRILLED							ASSORTED BOULDERS	25.1'-30.0'
	84	J-10	100	1/4"				524 W		SILT & SHALEY GRAVEL, TR. SAND	30.0'-30.2'
	126										DRILLED WITH "AX" DIAMOND BIT: REC: 8" PCS.
	582										
	701										
35	69	J-11	DRILLED							ASSORTED BOULDERS	30.2'-35.0'
	81	J-12	100	1/2"				524 W		DECOMPOSED SHALE	35.0'-35.1' "E" Spoon
	128										DRILLED WITH "AX" DIAMOND BIT: REC: 3" PCS.
	118										
	183										
40	↑	J-13	DRILLED							ASSORTED BOULDERS	35.1'-40.0'
		J-14	58	63				524 W GR		DECOMP. & WEATH. SHALE, SO. FINE TO MED. GRAVEL	40.0'-41.5' "E" Spoon
					63						DRILLED WITH "AX" DIAMOND BIT: REC: 6" PCS.
45	↑	J-15	DRILLED							ASSORTED BOULDERS	41.5'-45.0'
											DRILLED WITH "AX" DIAMOND BIT: REC: 18" 16 PCS & chips.
		J-16	DRILLED					524 GR		SHALE	45.0'-50.0'

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 2. HOLE NO. A-6

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. 10300-701

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-6
LINE & STA. 4+75
OFFSET 235' Rt.

PROJECT CITY OF ITHACA - SIX MILE CREEK DAMSITE
QUAD. LOCATION 75-1-K31 DATE, START 6-5-72 SURF. ELEV. 825.2'
SOIL SERIES DUNKIRK DATE, FINISH 6-12-72 DEPTH TO WATER -4.0'
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 16" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	5	10	15	20					
50			6	12	18	24						DRILLED WITH "AX" DIAMOND BIT: REC: 32" 15 pgs. & chps.
55		C-17 DRILLED								GRY	SHALE	500'-55.0' DRILLED WITH "AX" DIAMOND BIT: REC: 10" 6 pgs. & chps.
60	NOT CASED	C-18 DRILLED								GRY	SHALE	550'-60.0' DRILLED WITH "AX" DIAMOND BIT: REC: 9.5" 6 pgs.
65		C-19 DRILLED								GRY	SHALE	600'-65.0' DRILLED WITH "AX" DIAMOND BIT: REC: 4" pgs. "E" spoon
70		C-20 DRILLED								GRY	SHALE	65.0'-70.0' REFUSAL
											BOTTOM OF Hole @ 700'	

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 2 OF 2. HOLE NO. A-6

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E19300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-9
LINE & STA. _____
Bk Top Ext. 163722
OFFSET 84' 4"

PROJECT Cayuga Lake Basin Six Mile Creek Dam site
QUAD. LOCATION 75-1-K32 DATE, START July 10, 1972 SURF. ELEV. 709.6'
SOIL SERIES Dunkirk DATE, FINISH July 19, 1972 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 4.25" I.D. 3.75" WEIGHT OF HAMMER 300 lbs HAMMER FALL _____
SAMPLER O.D. 3.50" I.D. 3.00" INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
0												Drilled With Roller Bit Lost Wash Water @ 40' Spoon Refused @ 50'
5												0~5.0' Drilled With NX Diamond Bit
10		C-1 Drilled								Gry	Limey Shale	5.0~10.0' Recovery 60" 15 Pieces + Frags Drilled With NX Diamond Bit & 10' Double Tube Barrel
15		C-2 Drilled								Gry	Limey Shale	10.0~15.0' Recovery 62" 24 Pieces + Frags Drilled With NX Double Tube Barrel
20												
25		C-3 Drilled								Gry	Shale	Recovery 114.0" 31 Pieces + Frags 15.0~25.0' Drilled With NX Double Tube Barrel
30												
35		C-4 Drilled								Gry	Limey Shale	Recovery 120" 19 Pieces + Frags 25.0~35.0' Drilled With NX Double Tube Barrel
40												
45		C-5 Drilled								Gry	Shale	Recovery 116" 11 Pieces + Frags 35.0~45.0'
50												

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS J. DesChambeau
ROCK DESCRIPTIONS J. DesChambeau
DISTRICT SOILS ENGR. J. Christopher
SHEET 1 OF 2 HOLE NO. A-9

DISTRICT NO. 3
COUNTY Tompkins
B.S.M. PROJ. NO. E10700

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-9
LINE & STA. _____
@ Bl. Ten. E. 163+82
OFFSET 8' 4"

PROJECT Cayuga Lake Basin: Sixmile Creek Demolition

QUAD. LOCATION 75-1-K32 DATE, START 7/10/72 SURF. ELEV. 709.6'
SOIL SERIES Dunkirk DATE, FINISH 7/19/72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 1.25" I.D. 3.25" WEIGHT OF HAMMER 300 lbs HAMMER FALL _____
SAMPLER O.D. 3.50" I.D. 3.00" INSIDE LENGTH OF SAMPLER 18" CASING A SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
50												Drilled With NX Diamond Bit
												Recovery 68"
55		C-6 Drilled								Gry	Shale	45.0' ~ 55.0' 9 Pieces + Frags
												Drilled With NX Diamond Bit
												Some Core From Previous
												Run Was Picked Up In This Run
60		C-7 Drilled								Gry	Shale	Recovery 75" 3 Pieces
												55.0' ~ 60.0'
												Drilled With NX Diamond Bit
												Some Core From Previous
												Run was picked up in this Run
65												Recovery 122" 9 Pieces
		C-8 Drilled								Gry	Shale & Limey Shale	60.0' ~ 68.0'
												Drilled With NX Diamond Bit
70												
75												Recovery 109" 9 Pieces
		C-9 Drilled								Gry	Shale & Limey Shale	68.0' ~ 78.0'
												Drilled With NX Diamond Bit
80												
85												Recovery 120" 7 Pieces + Frags
		C-10 Drilled								Gry	Shale	78.0' ~ 88.0'
												Drilled With NX Diamond Bit
90												
95												Recovery 115" 9 Pieces + Frags
		C-11 Drilled								Gry	Shale	88.0' ~ 98.0'
												Bottom of Hole @ 98.0'
100												

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DRILL RIG OPERATOR J. Black
SOIL DESCRIPTIONS _____
ROCK DESCRIPTIONS J. DesChambeau
DISTRICT SOILS ENGR. J. Christopher
SHEET 2 OF 2 HOLE NO. A-9

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-9A
LINE & STA. 163+82.4
Bk. Tan. Ext. A4
OFFSET 84' LT

PROJECT Cayuga Lake Basin, Six-Mile Creek Dam Site
QUAD. LOCATION 75-1-K32 DATE, START 21 Jul 72 SURF. ELEV. 709.6
SOIL SERIES Dunkirk DATE, FINISH 16 Aug 72 DEPTH TO WATER None Observed
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 3 1/2" I.D. 3" WEIGHT OF HAMMER None HAMMER FALL
SAMPLER O.D. None I.D. None INSIDE LENGTH OF SAMPLER None CASING — SAMPLER —

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0 5	6 11	12 18	18 24						
0												Drilled with Quarry Bit and "Nx" Flush Coupled Casing 0.0' ~ 4.8' No Recovery
5												Drilled with "Nx" Diamond Bit 4.8'-10.0' Recovery = 26" 6 Pieces + Chips
10		C-1								Gry	SHALE Cores	Drilled with "Nx" Diamond Bit 10.0'-15.0' Recovery = 27" 4 Pieces + Chips
15		C-2								Gry	SHALE Cores	Drilled with "Nx" Diamond Bit 15.0' ~ 20.0' Recovery = 46" 10 Pieces + Chips
20		C-3								Gry	Shale with Boulder Cores	Drilled with "Nx" Diamond Bit 20.0'-25.0' Recovery = 19" 7 Pieces + Chips
25		C-4								Gry	Badly Fractured SHALE Cores	Drilled with "Nx" Diamond Bit 25.0'-30.0' Recovery = 33" 8 Pieces + Chips
30		C-5								Gry	Badly Fractured SHALE Cores	Drilled with "Nx" Diamond Bit 30.0'-35.0' Recovery = 74" 5 Pieces + Chips
35		C-6								Gry	SHALE Cores	Drilled with "Nx" Diamond Bit 35.0'-40.0' Recovery = 63" 11 Pieces + Chips
40		C-7								Gry	SHALE Cores	Drilled with "Nx" Diamond Bit 40.0'-45.0' Recovery = 57" 10 Pieces + Chips
45		C-8								Gry	SHALE Cores with Limey Shale seams	Drilled with "Nx" Diamond Bit 45.0'-50.0' Recovery = 36" 9 Pieces + Chips
50		C-9								Gry	Limey SHALE Cores	

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS None
ROCK DESCRIPTIONS D.B. Jenkins
DISTRICT SOILS ENGR. J.E. Christopher
O.J.
SHEET 1 OF 3 HOLE NO. A-9A

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. 510300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-9A
LINE & STA. 163+82.8
BK. Tan. Ext. A4.
OFFSET 84' L

PROJECT Cayuga Lake Basin, Six-Mile Creek Dam site
QUAD. LOCATION 75-1-K 32 DATE, START 21 Jul 72 SURF. ELEV. 709.6
SOIL SERIES Dunkirk DATE, FINISH 16 Aug 72 DEPTH TO WATER 287.5
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 3 1/2" I.D. 3" WEIGHT OF HAMMER — HAMMER FALL —
SAMPLER O.D. None I.D. — INSIDE LENGTH OF SAMPLER — CASING — SAMPLER —

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
50												Drilled with "NX" Diamond Bit 50.0' to 55.0' Recovery = 40" 4 Pieces + Chips
55		C-10								Gry	SHALE Cores	
60		C-11								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 55.0' - 60.0' Recovery = 60" 6 Pieces
65		C-12								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 60.0' - 65.0' Recovery = 58" 4 Pieces
70		C-13								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 65.0' - 70.0' Recovery = 46" 13 Pieces + Chips
75		C-14								Gry	SHALE Cores with Limey Shale Seams	Drilled with "NX" Diamond Bit 70.0' - 75.0' Recovery = 59" 8 Pieces
80		C-15								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 75.0' - 80.0' Recovery = 60" 2 Pieces
85		C-16								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 80.0' - 85.0' Recovery = 60" 5 Pieces
90		C-17								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 85.0' - 90.0' Recovery = 52" 6 Pieces
95		C-18								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 90.0' - 95.0' Recovery = 63" 5 Pieces
100		C-19								Gry	SHALE Cores	Drilled with "NX" Diamond Bit 95.0' - 100.0' Recovery = 60" 5 Pieces

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS —
ROCK DESCRIPTIONS D. B. Jenkins
DISTRICT SOILS ENGR. J. E. Christopher
D.J.
SHEET 2 OF 3 HOLE NO. A-9A

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. A-9A
LINE & STA. 163+82.8
BK. Tan. Ext. A.B.
OFFSET 84' LT

PROJECT Cayuga Lake Basin, Six-Mile Creek Dam site

QUAD. LOCATION 75-1-K32 DATE, START 21 Jul 72

SURF. ELEV. 709.6

SOIL SERIES Dunkirk

DATE, FINISH 16 Aug 72

DEPTH TO WATER None observed
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 3 1/2" I.D. 3"
SAMPLER O.D. None I.D. -

WEIGHT OF HAMMER None
INSIDE LENGTH OF SAMPLER -

HAMMER FALL
CASING - SAMPLER -

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER						CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24						
100													Drilled with "NX" Diamond Bit 100.0'-105.0' Recovery = 62" 5 Pieces
105		C-20									Gry	SHALE Cores	Drilled with "NX" Diamond Bit 105.0'-110.0' Recovery = 57" 5 Pieces
110		C-21									Gry	SHALE Cores	Drilled with "NX" Diamond Bit 110.0'-115.0' Recovery = 50" 8 Pieces
115		C-22									Gry	SHALE Cores	Drilled with "NX" Diamond Bit 115.0'-117.5' Recovery = 28" 1 Piece
		C-23									Gry	SHALE Cores	
120													Bottom of Hole @ 117.5'
125													Note: Intermittent loss of Wash Water from 10' to 19'. Lost Wash Water at 19'
													This Boring was drilled at a 45° Angle adjacent to DH# A-9.
130													
135													
140													
145													
150													

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS -
ROCK DESCRIPTIONS D. B. Jenkins
DISTRICT SOILS ENGR. J. E. Christopher
D. J.
SHEET 3 OF 3 HOLE NO. A-9A

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. 10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-1
LINE & STA. 89+73
OFFSET 36' RL

PROJECT CAYUGA LAKE BASIN - 6 MILE CREEK DAMSITE
QUAD. LOCATION 75-4-Y-4, DATE, START 5-23-72 SURF. ELEV. 861.8
SOIL SERIES DUNKIRK DATE, FINISH 5-31-72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75 I.D. 2.25 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 2.00 I.D. 1.50 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH DOWN SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18					
0	6										
	8										
	14										
	17										
	22										
5	19	J-1	5	8						M BR. SILT, TR. CLAY & GRAVEL	5'-6.5'
	25				10						
	35										
	43										
10	47									VARVED SILT, SO. SAND	
	27	J-2	6	6						(W) BR. TR. CLAY & GRAVEL	10'-11.5'
	34				4						
	38										
	62										
	66										
15	57	J-3	10	11						(W) BR. SILT, SO. SAND & GRAVEL	15'-16.5'
	116				12						
	93										
	79										
	47										
20	35	J-4	6	8						(W) BR. SILT, SO. FINE SAND	20'-21.5'
	52				11						
	63										
	126										
	77										
25	49	J-5	6	9						SILT, SOME FINE SAND, (W) BR. TR. CLAY	25'-26.5'
	71				14						
	77										
	120										
30	109									SILT, TR. FINE SAND	
	59	J-6	6	10						(W) BR. & CLAY	30'-31.5'
	72				12						
	112										
	145										
	146										
35	84	J-7	12	14						(W) BR. DENSE SILT, TR. CLAY	35'-36.5'
	157				15						
	135										
	152										
	228										
40	185	J-8	12	16						(W) BR. SILT, TR. CLAY	40'-41.5'
	440				22						
	531										
	692										
	870										
45	212	J-9	6	11						LAYERED SILT & FINE (W) BR. SAND	45'-46.5'
	296				16						
	318										
	391										
	408										

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS A. FRANKE
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 2. HOLE NO. B-1

HOLE NO. B-1
LINE & STA. B 89+73
OFFSET 36' R+

PROJECT CAYUGA LAKE BASIN - 6 MILE CREEK DAMSITE
QUAD. LOCATION 75/4/14 DATE, START 5-23-72 SURF. ELEV. 861.8
SOIL SERIES DUNKIRK DATE, FINISH 5-31-72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. <u>2.75</u>	I.D. <u>2.25</u>	WEIGHT OF HAMMER <u>300 lbs.</u>	HAMMER FALL
SAMPLER O.D. <u>2.00</u>	I.D. <u>1.50</u>	INSIDE LENGTH OF SAMPLER <u>12"</u>	CASING <u>18"</u> SAMPLER <u>18"</u>

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0 6	6 12	12 18	18 24						
50	126 180 202 241	J-10	8	12						W BR	VARIED SILT, TR. CLAY	50.0'-51.5'
	279											
55	118 131 177 198	J-11	6	10						W GR	BR. SILT, TR. CLAY, SAND & GRAVEL	55.0'-56.5'
	207											
60	96 147 163 190	J-12	9	20						W GR	SILT, TR. CLAY & GRAVEL	60.0'-61.5'
	227											
65	101 160 192 211	J-13	10	13						W GR	MOTTLED SILT, TR. CLAY, GRAVEL & SAND	65.0'-66.5'
	230											
70	↑ ↓ 240 280	J-14	42	51						M GR	SILT, TR. CLAY & GRAVEL	70.0'-71.5'
												DRILLED WITH HAWTHORNE BIT: 71.5' - 75.0'
75	↓	J-15	29	53						M GR	SILT, TR. CLAY	75.0' - 76.5'
											BOTTOM OF HOLE @	76.5'

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANKE
ROCK DESCRIPTIONS -
DISTRICT SOILS ENGR. J. CHRISTOPHER
A.
SHEET 2 OF 2 HOLE NO. B-1

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10,300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-3
Coordinates
N 87° 46' E 533.430

PROJECT Cayuga Lake Basin - Simile Creek Damsites

QUAD. LOCATION 75-1-52-19 DATE, START 10/21/71

SURF. ELEV. 735.9

SOIL SERIES Dunkirk DATE, FINISH 10/27/71

DEPTH TO WATER -2.0 ft.

(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75" I.D. 2.25"
SAMPLER O.D. 2.00" I.D. 1.50"

WEIGHT OF HAMMER 300 lbs
INSIDE LENGTH OF SAMPLER 18"

HAMMER FALL
CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24	24					
0	2											Used 4" Casing 0~25'
	5											Used 2 1/2" Casing 25~28.3'
	17											Drilled 0~5' with 5/8" Roller Bit.
	76											
5'	179											
	25	J-1	26	33					M	Gry	Silt, Trace of Fine Sand and Fine Shaley Gravel	5.0~6.5'
	61				26							Drilled 5~10' with 5/8" Roller Bit.
	87											
	162											
10'	429											
	48	T-2	58	60=2"					M	Gry	Silt, Trace of Fine Sand and Fine Shaley Gravel	10.0~10.7'
	68											Drilled 10.7~15.0' with Carbide Quarry Bit.
	98											
	328											
15'	205								M	Gry	Silt, Trace of Fine Sand and Weathered Shale Pieces	15.0~15.4'
	129	T-3	100=3"									Drilled 15.0~20.0' with Carbide Quarry Bit.
	101											
	84											
	191											
20'	490											
	1100	T-4	16	100=6"					M	Gry	Layered Silt and Fine Sand Some Weathered Shale Pieces	20.0~21.0'
	192											Drilled 20.0~23.3' with Carbide Quarry Bit (Jar Sample)
	160											Drilled with "Ax" Diamond Bit 23.5~25.0'
	301											23.5~25.0' Recovery 8"
25'	425	C-5	Drilled							Gry	Limey Shale Boulders	25.0~26.5'
	28	J-6	16	32					M	Gry	Angular Gravel Pieces	Drilled with "Ax" Diamond Bit Recovery 176" 13 Pieces
	112				64							
	166											
	127=4'											
30'		C-7	Drilled							Gry	Shale	28.3~30.0'
												Drilled with "Ax" Diamond Bit Recovery 54" Pieces
35'		C-8	Drilled							Gry	Shale	30.0~35.0'
												Drilled with "Ax" Diamond Bit 56" Recovery 39 Pieces
40'		C-9	Drilled							Gry	Shale	35.0~40.0'
												Drilled with "Ax" Diamond Bit 56" Recovery 40 Pieces
45'		C-10	Drilled							Gry	Shale	40.0~45.0'
												Drilled with "Ax" Diamond Bit Recovery 57" 42 Pieces
50'		C-11	Drilled							Gry	Shale	45.0~50.0'

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF THE BIDDER.

DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS J. Des Chambeau
ROCK DESCRIPTIONS J. Des Chambeau
DISTRICT SOILS ENGR. J. Christopher
SHEET 1 OF 1. HOLE NO. B-3

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. 10390

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-4
LINE & STA. "N" 878,000
OFFSET "E" 533,960

PROJECT CAYUGA LAKE BASIN - 6 MILE CREEK DAMSITE

QUAD. LOCATION 75-4-K3 DATE, START 3/13/72 SURF. ELEV. 822.6
SOIL SERIES DUNKIRK DATE, FINISH 4/18/72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 4.25 I.D. 3.75 WEIGHT OF HAMMER 300 LBS. HAMMER FALL
SAMPLER O.D. 3.50 I.D. 3.00 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0-6	6-12	12-18	18-24	24					
0	6											
	7											
	13											
	23											
5	31											
	73	J-1	4	8						GRY BR.	SILT, TR. SAND, CLAY & FINE GRAVEL	6'-0"-6'-5"
	90				15							
	142											
	190											
	154											
10	380	J-2	12	16						W BR.	SILT & SAND, SO. FINE GRAVEL, TR. CLAY & ORGANICS	10'-0"-11'-5"
	500				23							
	280											
	300											
15	303											
	240	J-3	2	3						GRY BR.	SILT, TR. CLAY & SAND	15'-0"-16'-5"
	280				2							
	280											
	330											
20	243											
	395	J-4	4	6						BR.	SILT, TR. CLAY & SAND	20'-0"-21'-5"
	400				6					W GR.		
	355											
	335											
25	295											
	260	J-5	1	2						W GR.	SILT, TR. CLAY	25'-0"-26'-5"
	207				2							
	200											
	215											
30	200											
	230	J-6	2	2						GRY W BR.	SILT, TR. CLAY	30'-0"-31'-5"
	215				3							
	220											
	218											
35	228											
	150	J-7	2	2						W GR.	SILT, SO. CLAY, TR. GRAVEL & SAND	35'-0"-36'-5"
	300				3							
	257											
	243											
40	200											
	228	J-8	3	3						W BR.	SILT, SO. SAND, TR. GRAVEL & CLAY	40'-0"-41'-5"
	315				4							
	1											
45	10	J-9	2	6						W GR.	SILT & CLAY TO SILT, SO. SAND, TR. GRAVEL & CLAY (TILL)	45'-0"-46'-5" "AK" SPOON
	20				18							
	0											
50	1											

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANK
ROCK DESCRIPTIONS —
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 2. HOLE NO. B-4

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. 10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-4
LINE & STA. "N" 87A.000
OFFSET "E" 533.960

PROJECT CAYUGA LAKE BASIN - 6 MILE CREEK DAM SITE
QUAD. LOCATION 75-4-K3 DATE, START 3-13-72 SURF. ELEV. 822.6
SOIL SERIES DUNKIRK DATE, FINISH 4-18-72 DEPTH TO WATER NONE OBSERVED
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 4.25 I.D. 3.75 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 3.50 I.D. 3.00 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
60	+	J-10	56	100/3				*			Gravel, sand & silt, tr. M GRAY CLAY (GRAVELLY TILL)	"A" spoon 500'-50.9'
65								*			No sample	DRILLED WITH QUARRY BIT: 60.9' - 65.0'
60	+							*				"A" spoon REFUSED @ 65.0'
65	+	J-11	DRILLED					*			BOULDERS	DRILLED WITH "N" DIAMOND BIT: REC: 6" 6 pcs. 65.0' - 65.0'
70	+							*				
75	+	J-12	DRILLED					*			BOULDERS	DRILLED WITH "N" DIAMOND BIT: REC: 8" 4 pcs. 65.0' - 75.0'
	+	J-13	52	100/3				*			BE. FINE TO MED. GRAVEL, SO. W GRAY SAND & SILT	75.0' - 75.8'
	+							*			BOTTOM OF HOLE @ 75.8'	

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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS A. FRANK
ROCK DESCRIPTIONS -
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 2 OF 2 HOLE NO. B-4

DISTRICT NO. 3
COUNTY TOMPKINS
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-5
LINE & STA. SEE REMARKS
for DH Location

OFFSET

PROJECT CATUGA LAKE BASIN: SIX MILE CREEK DAMSITES (BETHEL GROVE)
QUAD. LOCATION 75-4-12 DATE, START 22 SEP 71 SURF. ELEV. 719.9
SOIL SERIES DUNKIRK DATE, FINISH 12 OCT 71 DEPTH TO WATER -4.0 ft.
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 4 1/4" I.D. 3 3/4" WEIGHT OF HAMMER 300 lbs HAMMER FALL
SAMPLER O.D. 2 1/2" I.D. 1 1/2" INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS OR CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	GRID LOCATION from USGS SHEETS: REMARKS N 878, 290 E 534, 245
			0	6	12	18	24					
0	16											
200	C-1	DRILLED									Boulder Cores 9 1/2" Rec. 1 pc.	NX DIAMOND BIT 1.0' to 3.0'
26												
53	C-2	DRILLED									Boulder Cores 8 1/2" Rec. 5 pcs.	NX DIAMOND BIT 3.0' to 5.0'
79												
5	3	J-3	9	17					W	BR	MEDIUM SAND, some Silt and Gravel	5.0' - 6.5'
8					13							
30												
196											SHALEY GRAVEL, trace Silt and Clay	Hawthorne Bit ahead of casing 6.5' - 10.0'
512												
10	91	J-4	14	16					W	GR		10.0' - 11.5'
437					20							
417												
522	C-5	DRILLED									Boulder Cores 6" Rec. 6 pcs. + chips	Hawthorne refused 11.5' NX DIAMOND BIT 11.5' to 15.0'
15	871											Boulder Buster to 15.0'
62	J-6	21	32						W	BR	SHALEY GRAVEL, some Sand and Silt	15.0' - 16.5'
73					46							
102												
133												
20	139										SHALEY GRAVEL, trace Silt	Hawthorne Bit ahead of casing 16.5' - 20.0'
72	J-7	4	13						W	BR		20.0' - 21.5'
80					26							
96												
210											SHALEY GRAVEL, trace Sand and Silt	Hawthorne Bit ahead of casing 21.5' - 25.0'
25	270											
95	J-8	8	23						W	BR		25.0' - 26.5'
104					53							
116												
132												
30	158										SHALEY GRAVEL, trace Sand and Silt	Hawthorne Bit ahead of casing 26.5' - 30.0'
140	J-9	9	17						W	BR		30.0' - 31.5'
345					23							
672												
833												
35	1000										SHALEY GRAVEL and SAND, trace Silt	Hawthorne Bit ahead of casing 31.5' - 35.0'
456	J-10	12	21						W	BR		35.0' - 36.5'
152					32							
186												
170											FINE GRAVEL and SHALEY GRAVEL, trace Sand	Roller Bit 36.5' - 40.0' ahead of casing. Boiled in 3.5' at 40.0'
40	261											40.0' - 41.5'
232	J-11	WASH										
208		SAMPLE										
333											SHALEY GRAVEL and FINE GRAVEL, some Sand, trace Silt and Clay	Roller Bit ahead of casing 41.5' to 45.0'
266												
290												
45	298	J-12	100	87								45.0' - 46.5'
168					65							
300												
275											Roller Bit ahead of casing 46.5' to 50.0'	
50	450											

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DRILL RIG OPERATOR J. Black
SOIL DESCRIPTIONS J. Small
ROCK DESCRIPTIONS J. Small
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 3 HOLE NO. B-5

HOLE NO. B-5
LINE & STA. SEE REMARKS
for DH Location
OFFSET _____

PROJECT CAYUGA LAKE BASIN: SIXMILE CREEK DAMSITES (BETHEL GROVE)

QUAD. LOCATION 75-4-54-79 DATE, START 22 SEP 71

SURF. ELEV. 719.9

SOIL SERIES DUNKIRK

DATE, FINISH 12 OCT 71

DEPTH TO WATER -4.0 ft.
(ALSO DESCRIBE UNDER "REMARKS")

CASING	O.D.	<u>4 1/4"</u>	I.D.	<u>3 3/4"</u>
SAMPLER	O.D.	<u>2"</u>	I.D.	<u>1 1/2"</u>

WEIGHT OF HAMMER 300 lbs
INSIDE LENGTH OF SAMPLER 18"

HAMMER FALL
CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	GRID LOCATION from USGS sheets: REMARKS N 878, 290 E 534, 245
			0 6	6 12	12 18	18 24					
50	380	J-13	19	33			0.0	M	BR	SHALEY GRAVEL and GRAVEL, trace Sand and Silt	50.0' - 51.5'
	245				52		0.0				
	380						0.0				
	281						0.0			SHALEY GRAVEL, some Sand, trace Silt	
55	362						0.0	W	BR		55.0' - 55' 3"
	300	J-14	100	for 3"			0.0				
	245						0.0				
	621						0.0			SHALE and SANDSTONE BOULDER CORES	NX DIAMOND BIT 55'3" to 60.0'
	397	C-15	DRILLED				0.0			4" REC. 3 pcs	
60	325						0.0				
	376	J-16	16	30			0.0	M	BR	SHALEY GRAVEL, some Sand, trace Silt	60.0' - 61.5'
	396				64		0.0				
	310						0.0				
	329						0.0				
65	274						0.0			GRAVEL, some Sand, trace Silt and Clay	
	248	J-17	10	25			0.0	W	BR		65.0' - 66.5'
	283				53		0.0				
	240						0.0				
	237						0.0				
70	415						0.0				REFUSAL
	328						0.0				
	450	C-18	DRILLED				0.0			BOULDER CORES	NX DIAMOND BIT 69.5' to 74.5'
	476						0.0			22" REC. 9 pcs.	Boiled up 5.0' in casing after coring
75	283						0.0				
	300						0.0				
	400						0.0				
	1650						0.0			FINE SHALEY GRAVEL and SAND	Boiled up 5.0' in casing after cleanout to 80.0'
	1365						0.0				80.0'
80	1300	J-19	WASH SAMPLE				0.0	W	GR		
	488						0.0				
	1148						0.0				
	1986						0.0				
	3004						0.0				
85	680						0.0			CHANGED FROM 4" CASING to 2 1/2" CASING AT 85.0 ft.	
	51						0.0				
	100						0.0				
	126						0.0				
	148						0.0				
90	184						0.0			SHALEY GRAVEL and Silt, some Sand, trace Clay	90.0' - 91.5'
	67	J-20	49	39			0.0	M	GR		
	64				31		0.0				Hawthorne Bit ahead of casing 91.5' to 95.0'
	165						0.0				
	807						0.0				"E" spoon refused at 95.0'
95							0.0				
							0.0				
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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS J. SMALL
ROCK DESCRIPTIONS J. SMALL
DISTRICT SOILS ENGR. J. CHRISTOPHER
JS
SHEET 2 OF 3 HOLE NO. B-5

HOLE NO. B-5
LINE & STA. SEE REMARKS
for 2nd Location
OFFSET _____

PROJECT CAYUGA LAKE BASIN: SIXMILE CREEK DAMSITES (BETHEL GROVE)

QUAD. LOCATION 75-5549 DATE, START 22 SEP 71 SURF. ELEV. 719.9
SOIL SERIES DUNKIRK DATE, FINISH 12 OCT 71 DEPTH TO WATER -4.0 ft.

Casing O.D. $4\frac{1}{4}"$ I.D. $3\frac{3}{4}"$		Weight of Hammer 300 lbs	Hammer Fall
Sampler O.D. 2" I.D. $1\frac{1}{2}"$		Inside Length of Sampler 18"	Casing 18" Sampler 18"

[illegible]

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS J. Small
ROCK DESCRIPTIONS J. Small
DISTRICT SOILS ENGR. J. CHRISTOPHER
JS
SHEET 3 OF 3 HOLE NO. B-5

DISTRICT NO. 3
COUNTY TOMPKINS
B.S.M. PROJ. NO. 10300701

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-6
LINE & STA. N 878.725
OFFSET E 535.640

PROJECT CAYUGA LAKE BASIN - G HILE CREEK DAMSITE
QUAD. LOCATION T5/4/12 DATE, START 3-1-72 SURF. ELEV. 706.3
SOIL SERIES DUNKIRK DATE, FINISH 3-6-72 DEPTH TO WATER 1.0'
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 4.25 I.D. 3.75 WEIGHT OF HAMMER 300 lbs. HAMMER FALL
SAMPLER O.D. 3.50 I.D. 3.00 INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER				CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18					
0	0		6	12	18	24					NOTE: USED 6" Roller BIT 0-0' TO 9-0' - then drove CASING. DEILLED WITH "NY" DIAMOND BIT: REC: 21" 7 pgs. 9-0' - 12-0'
0	0										
0	0										
0	0										
0	0										
5	0										DEILLED WITH "NY" DIAMOND BIT: REC: 24" 6 pgs. & chps. 12-0' - 17-0'
5	81										
5	172										
5	385										
5	↑										
10											DEILLED WITH "NY" DIAMOND BIT: REC: 96" 24 pgs. 17-0' - 26-0'
10											
10											
10											
10											
15											BOTTOM OF Hole @ 26-0'
15											
15											
15											
15											
20											
20											
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DRILL RIG OPERATOR J. BLOCK
SOIL DESCRIPTIONS —
ROCK DESCRIPTIONS A. FRANK
DISTRICT SOILS ENGR. J. CHRISTOPHER
SHEET 1 OF 1. HOLE NO. B-6

DISTRICT NO. 3
 COUNTY Tompkins
 PROJ. NO. E10300

STATE OF NEW YORK
 DEPARTMENT OF TRANSPORTATION
 SOIL MECHANICS BUREAU
 SUBSURFACE EXPLORATION LOG
 (STATE FORCES)

HOLE NO. B-7
 LINE & STA. _____
 Coordinates: N879.265±
 OFFSET E535.020±

PROJECT Cayuga Lake Basin - Six Mile Creek Dam Site (Bethel Grove)
 QUAD. LOCATION 75-4-M18 DATE, START 24 Apr 72 SURF. ELEV. 824.9
 SOIL SERIES Dunkirk DATE, FINISH 1 May 72 DEPTH TO WATER None Observed
 (ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75" I.D. 2.25" WEIGHT OF HAMMER 300 Lb HAMMER FALL _____
 SAMPLER O.D. 1.5" I.D. 1.0" INSIDE LENGTH OF SAMPLER 18" CASING 8" SAMPLER 8"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
0	6											
	6											
	8											
	9											
5	11											
	9	J-1	2	3					M B _{ry}		SILT, trace Clay	5.0'-6.5'
	9				4							
	11											
	12											
10	15											
	16	J-2	5	10					M B _{ry}		SILT, trace Clay	10.0'-11.5'
	21				7							
	24											
	25											
15	20											
	21	J-3	6	4					W Gry		SILT, Some Clay	15.0'-16.5'
	22				5							
	25											
	22											
20	23											
	33	J-4	8	8					W Gry		SILT, Some Clay	20.0'-21.5'
	34				8							
	28											
	21											
25	28											
	35	J-5	1	1					W Gry		SILT, Some Clay	25.0'-26.5'
	35				1							
	35											
	37											
30	42											
	33	J-6	1	2					W Gry		SILT, Some Clay	30.0'-31.5'
	34				2							
	37											
	38											
35	39											
	29	J-7	WOH	WOH					W Gry		SILT, Some Clay	35.0'-36.5'
	27				2							
	35											
	35											
40	37											
	29	J-8	2	2					W Gry		SILT, Some Clay	40.0'-41.5'
	34				2							
	37											
	50											
45	45											
	51	J-9	1	2					W Gry		SILT, Some Clay	45.0'-46.5'
	57				2							
	59											
	68											
50	72											

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DRILL RIG OPERATOR J. Block
 SOIL DESCRIPTIONS D.B. Jenkins
 ROCK DESCRIPTIONS -
 DISTRICT SOILS ENGR. J. E. Christopher
 D.J.
 SHEET 1 OF 2 HOLE NO. B-7

DISTRICT NO. 3
COUNTY Tompkins
PROJ. NO. E10300

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU
SUBSURFACE EXPLORATION LOG
(STATE FORCES)

HOLE NO. B-7
LINE & STA. Coordinates: N879265+
OFFSET E 535020±

PROJECT Cayuga Lake Basin - Six Mile Creek Dam Site (Bethel Grove)
QUAD. LOCATION 75-4-M18 DATE, START 24 Apr 72 SURF. ELEV. 824.9
SOIL SERIES Dunkirk DATE, FINISH 1 May 72 DEPTH TO WATER None Observed
(ALSO DESCRIBE UNDER "REMARKS")

CASING O.D. 2.75" I.D. 2.25" WEIGHT OF HAMMER 300 LB HAMMER FALL
SAMPLER O.D. 1.5" I.D. 1.0" INSIDE LENGTH OF SAMPLER 18" CASING 18" SAMPLER 18"

DEPTH BELOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER					CROSS SECTION	MOISTURE	COLOR	DESCRIPTION OF SOIL AND ROCK	REMARKS
			0	6	12	18	24					
50	54	J-10	1	1						W Gry	SILT, Some Clay, Trace Gravel and Sand	50.0'-51.5'
	61				1							
	66											
	81											
55	82	J-11	1	2						W Gry	SILT, Some Clay, Trace Sand	55.0'-56.5'
	90				1							
	84											
	90											
60	100	J-12	2	2						W Gry	SILT, Some Clay, Trace Gravel & Sand	60.0'-61.5'
	105				3							
	109											
	100											
65	110	J-13	1	2						W Gry	SILT, Some Clay, Trace Gravel & Sand	65.0'-66.5'
	130				2							
	140											
	150											
70	148	J-14	2	2						W Gry	SILT, Some Clay, Trace Sand	70.0'-71.5'
	140				2							
	164											
	161											
75	167	J-15	1	1						W Gry	SILT, Some Clay, Trace Gravel & Sand	75.0'-76.5'
	104				2							
	125											
	126											
	130											
80	148	J-16	2	3						W Gry	SILT, Some Clay	80.0'-81.5'
	235				2							
	375											
	525											Drilled w/AX Diamond Bit 84.0'-85.0' Recovery = 6" 4 Pieces + Chips
85	250	J-17								Gry	Boulder Cores	
	330	J-18	31	39						W Gry	SAND and SILT, Some Gravel	85.0'-86.5'
	390				48							
	1183											Drilled w/AX Diamond Bit 86.5'-94.0' Recovery = 7" 8 Pieces
	3123											
90	1240											
	420											
	632											Drilled w/AX Diamond Bit 94.0'-94.5' Recovery = 4" 3 Pieces + Chips
		J-19								Gry	Boulder Cores	
		J-20								Gry	Boulder Cores	
95												Drilled w/AX Diamond Bit 94.5'-97.0' No Recovery
												Note: WOH = Weight of Hammer.
											Bottom of Hole @ 97.0'	
100												

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DRILL RIG OPERATOR J. Block
SOIL DESCRIPTIONS 3 Jenkins
ROCK DESCRIPTIONS -
DISTRICT SOILS ENGR. J. E. Christopher
SHEET 2 OF 2 HOLE NO. B-7

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